

**Fauna of  
New Zealand**  
Ko te Aitanga Pepeke  
o Aotearoa

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**Fauna of New Zealand**  
**Ko te Aitanga Pepeke o Aotearoa**

**Number / Nama 59**

**Erotylinae**  
(Insecta: Coleoptera:  
Cucujoidea: Erotylidae):  
taxonomy and biogeography

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**Manaaki  
Whenua  
P R E S S**

**Lincoln, Canterbury, New Zealand**

**2007**

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### Cataloguing in publication

Skelley, Paul E

Erotylinae (Insecta: Coleoptera: Cucujoidea: Erotylidae): taxonomy and biogeography / Paul E.

Skelley; Richard A. B. Leschen – Lincoln, N.Z. : Manaaki Whenua Press, Landcare Research, 2007.

(Fauna of New Zealand, ISSN 0111–5383 ; no. 59).

ISBN 978-0-478-09391-9

I. Leschen, Richard A. B. II. Title III. Series

UDC 595.763.69

### Suggested citation:

Skelley, P. E.; Leschen, R. A. B. 2007. Erotylinae (Insecta: Coleoptera: Cucujoidea: Erotylinae): taxonomy and biogeography. *Fauna of New Zealand* 59, 58 pp.

Prepared for publication by the series editor and the author using computer-based text processing, layout, and printing at Landcare Research, Private Bag 92170, Auckland, New Zealand.

Māori text by W. Te Rākihawea, Ngaruawahia.

Published by Manaaki Whenua Press, Landcare Research, P.O. Box 40, Lincoln, Canterbury, N.Z.

Website: <http://www.mwpress.co.nz/>

Printed by PrintLink Ltd, Wellington

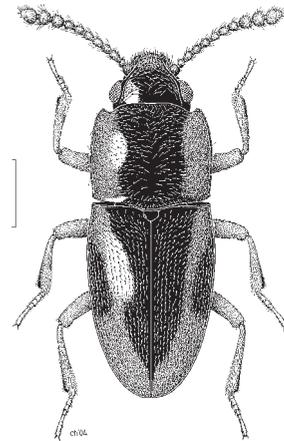
Date of publication 7 September 2007

Front cover: *Kuschelengispolitus* (White) (Illustrator: D. W. Helmore).

Publication of the *Fauna of New Zealand* series is the result of a research investment by the Foundation for Research, Science and Technology under contract number C09X0501.

## POPULAR SUMMARY

## HE WHAKARĀPOPOTOTANGA

Class **Insecta**Order **Coleoptera**Superfamily **Cucujoidea**Family **Erotylidae**Subfamily **Erotylinae**

**Illustration / Whakaahua:** *Cryptodacne synthetica* Sharp  
(Illustrator / Kaiwhakaahua: D. W. Helmore).

The subfamily Erotylinae in New Zealand consists of 8 species placed in 2 genera: *Kuschelengis*, a new genus described for the single species *K. politus*, and *Cryptodacne*, consisting of 7 species, 2 of which are described as new.

As a family, the Erotylidae is difficult to diagnose, but can be distinguished from most New Zealand beetles by the combination of the following characters: glandular ducts present throughout the body, but most notable at the corners of the prothorax, mesocoxal cavities closed by lateral extensions of the metaventrite, elytral epipleura complete and extending to apex, abdominal ventrites equal in length to each other, aedeagus with a laterally compressed median lobe, and usually 2 (or 1) elongate and narrow penile struts.

Members of Erotylinae can be easily separated from other New Zealand erotylids by having the procoxal cavities completely closed by lateral extensions of the prosternal process. They also tend to have more convex bodies that are larger in size than other New Zealand erotylids. The subfamily Erotylinae is a relatively small group in New Zealand considering that nearby Australia has 50 species.

All species are placed in the tribe Dacnini, which is relatively widespread in Australasia and the Holarctic. The genus *Cryptodacne* is endemic to New Zealand, while *Kuschelengis* is present in New Caledonia where there may be up to 10 undescribed species. Most specimens are collected from rotten wood and leaf litter, and, like all Erotylinae, the New Zealand species are strictly fungus feeding. Fungus host records are few but indicate that species feed on large-bodied polypore or bracket fungi.

A biogeographic analysis of *Cryptodacne* shows that *C. rangiauria* speciated relatively recently after arriving at the Chatham Islands via dispersal, and this is consistent with data from other organisms.

**Ngā Erotylinae**

E waru ngā momo o te whānau iti o ngā Erotylinae o Aotearoa kei ngā puninga e rua. Ko *Kuschelengis*, he puninga hōu e whakaahua ana i te momo takitahi *K. politus*, me *Cryptodacne*, e 7 ōna momo, e 2 o ērā e whakaahuatia ana he hōu.

Hei whānau, he uaua a ngāi Erotylidae te whakatau, engari e taea te tautohu mai i te nuinga o ngā pītara o Aotearoa nā ētahi o ngā āhuatanga e whai ake nei: ngā ngongo repe i roto i te katoa o te tinana engari tino kitea i ngā koko o te wāhanga tuatahi o te hōpara (prothorax); ngā puare (mesocoxal) ka katia e ngā toronga kōtaha o waenga o te tāpuku (metaventrite); e kapi ana ngā elytral epipleura me te whātoro ki te tihi; te wāhanga o ngā ventrite o te takapū he rite tahi te roa; te pokopoko waenga o te aedeagus e pineke kōtaha ana; ngā toko ure roroa, whāiti e 2 i te nuinga o te wā (1 rānei i ētahi wā).

E māmā noa ai a ngāi Erotylinae te tautohu i ētahi atu erotylid o Aotearoa nā te katia katoatia o ngā puare procoxal e ngā toronga kōtaha o te tukanga prosternal. He koropuku ake hoki ngā tinana me te rahi ake i ētahi atu erotylid o Aotearoa. He kāhui āhua pakupaku te whānau iti o ngāi Erotylinae i Aotearoa ina maharatia ngā momo e 50 o te whenua tata mai o Ahitereiria.

Ka whakanohoa te katoa o ngā momo ki te iwi Dacnini, e huhua ana te noho puta noa i Ahitereiria me te Holarctic. He toiwhenua ki Aotearoa te puninga *Cryptodacne*, engari a ngāi *Kuschelegis* ka kitea i Kanaki kei reira pea ko tōna 10 nei ngā momo kāore anō i whakaahuatia ā-tuhi. Te nuinga

(continued overleaf)

(haere tonu)

Contributor **Paul Skelley** was born and raised in Decatur, Illinois, a city centered in the agricultural midwestern United States. His hobbies included bird watching, fishing, stamp and coin collecting, and wandering around the small wooded stream near his house. His first entomological endeavour was catching adult cabbage loopers, which were used unsuccessfully as fishing bait. He was introduced to entomology as a science in the Boy Scouts while working on a project to build a display collection at a local nature center. After that exposure, he started to build an insect collection. While in college at Eastern Illinois University, he took a part-time job curating the University beetle collection. From that point he knew what he wanted to do. He graduated from Eastern Illinois University with a major in Zoology, and went to the University of Florida for graduate work. His Masters thesis was a faunal study of the Erotylidae of Florida, which focused on life histories. His Ph.D. dissertation was a revision of the genus *Ischyru* Lacordaire north of Panama. While working on his Ph.D. he accepted a position in the Florida State Collection of Arthropods and has been there since. His interests in beetles have focused on the Erotylidae, Aphodiinae (Scarabaeidae), and beetle natural histories in the south-eastern United States. The majority of his works has described taxa, cleaned up taxonomies at lower levels of the classification system, or compiled information into single resources — all in an attempt to grasp Biodiversity at its foundation so that others can make progress. He likes to use and discover innovative collecting techniques that might produce novel data on beetle behaviours, not to mention the potential to catch new beetles for the collection. When not working on beetles or playing with his two sons, he likes to hike and observe nature.



(continued overleaf)

o ngā tīpakonga he mea kōhi i ngā rākau pīrau, i ngā parapara rau ā, pērā i te āhua o ngā Erotylinae katoa, he harore anake te kai a ngā momo o Aotearoa. Kāore i nui ngā kōrero kua oti mō te rauropi papa harore engari ko te tohu ka kai ngā momo i te harore pōare nunui (polypore), i te harore whata rānei.

E ai ki te tātaritanga kōiora-arowhenua o ngā *Cryptodacne* nō nā tata noa nei a *C. rangiauria* i whakamomo mai ai, whai muri tonu i te mararatanga atu ki ngā moutere o Rerekohu, ka mutu e rite ana tēnei ki ngā raraunga mai i ētahi atu rauropi.

I whānau, i pakeke mai a **Paul Skelley** i Decatur, Illinois, he tāone e pokapū ana i te rohe ahuhwhenua o waenga ki te uru o Amerika. Ko ngā mahi e ngākau nui ai ia he mātaki manu, he hī ika, he kōhi panekuini, kōhi nakunaku moni me te karore haere i te roma o te ngahere tata ki tana kāinga. Ko tana kaupapa mātai pepeke tuatahi he hopu tāwhana kāpeti i whakamahia hei mounu ika ā, kāore he aha i mau. Ko tana tomonga tuatahi ki te ao pūtaiao o te mātai pepeke i ngā hui a ngā Boy Scouts i a ia e whai ana ki te waihanga kohinga hei whakaaturanga ki tētahi pokapū taiao o te rohe. Mutu mai ana tērā ka tūmata te āta waihanga kia nui ake ai tana kohinga pepeke. I a ia i Te Whare Wānanga o Illinois ki te Rāwhiti, ka mahi harangote hei kaitiaki i te kohinga pītara o te whare wānanga. Mai i tērā wā i mārāma ai ia ki te huarahi hei takahi māna. I whakawhiwhia ia e Te Whare Wānanga o Illinois ki te Rāwhiti ki tana tohu mātauranga matua e pā ana ki te Mātai Kararehe, ā, ka haere ki Te Whare Wānanga o Florida mahi ai. Ko te take kōrero o tana tohu paerua he mātautanga ao kararehe, ko ngā Erotylidae o Florida, i arotahia ai ngā hītori kōiora. Ko te kauwhau hōhonu o tana tohu Tākutatanga he arotakenga o te puninga *Ischyru* Lacordaire ki te raki o Panama. I a ia e mahi ana i tana Ph.D. ka whai tūranga ia i te ‘Florida State Collection of Arthropods’ ā, e mahi tonu nei i reira. Ko tana ngākau nui ki te pītara kua hua hei arotahinga i ngā Erotylidae, i ngā Aphodiinae (Scarabaeidae), me te mātai i te ao tūroa o ngā pītara i te tonga mā rawhiti o Amerika. Te nuinga atu o āna mahi he whakaahua tātai, he whakatikatika i ngā tātai hono o raro mai o te pūnaha whakarōpū, he whakahiato pārongo rānei hei rauemi takitahi – e ngana noa ana kia mārāma pai ake ai ngā tūāpapa o te renga kōiora hei whaiwhai ake mā ētahi atu. He pai ki a ia te whakamahi me te tūhura rautaki kohikohi, ā, kia auaha hoki. Mai i tēnei e puta ai pea ētahi raraunga hōu mō ngā whanonga o ngā pītara, aua atu te hopu pītara hōu mō te kohikohinga. Ki te kore ko ngā pītara te mahi, ko te tākaro rānei ki ana tama e rua, he pāreka ki a ia te hikoiki ki mātaki i te taiao.

(haere tonu)



Contributor **Rich Leschen** was born in Newport, Arkansas, a small rural community in the southern United States, and raised in the large city of St Louis, Missouri. He spent his early life interested in palaeontology, herpetology, and music. After graduating from Southwest Missouri State University (Springfield) with a major in biology and a minor in geology, he worked as a soil consultant, during which time fieldwork helped him develop interests in edible mushrooms and bird watching. Missing academic pursuits, he eventually began a Masters program at the University of Arkansas (Fayetteville), and started work that would form the basis for his ongoing studies on the systematics, evolution, and ecology of mycophagous Coleoptera. His Masters project was a list of the fungus-feeding Coleoptera of Arkansas, and much of his time was spent collecting beetles and becoming familiar with the North American fauna. During this time at Arkansas, Rich met Paul Skelley through correspondence, and who was also doing a Masters, and over the years they have collaborated on several projects on Erotylidae. After completing his Masters Rich went to University of Kansas to work on the systematics of Cryptophagidae, under the tutelage of Steve Ashe, but spending a significant portion of his time working on other groups, including other members of Cucujoidea (e.g., Erotylidae) and Staphylinoidea (scaphidiine staphylinids). This work was facilitated by a curatorial assistant position at the Snow Entomological Museum that allowed Rich to be more broadly trained in the identification and systematics of world Coleoptera and to collect beetles throughout Latin America. Several grants allowed him to visit museums in North America, Europe, and Latin America.

(continued overleaf)

I whānau mai te kaituhi, a **Rich Leschen**, i Newport, he paenoho tāngata i te taiwhenua, rohe o Arkansas, i te taha tonga o Amerika. Ka tipu ake ia i te tāone nui o St Louis, i Missouri. Ko te mātai mātātoka, te mātai ngārara, nukuwai, me te puoro ngā kaupapa i ngākau nuitia e ia i ōna tau tuatahi i te whare wānanga. Nōna ka whiwhi i tana tohu paetahi (ko te koiora te kaupapa mātāmua, ko te tātai arowhenua te kaupapa mātāmuri) i te Whare Wānanga o te Rohe Nui o Missouri ki te Uru-mā-tonga (i Springfield), ka haere hei mātanga oneone. I roto i āna mahi tirotiro oneone, ka tūmata tana aro nui ki ngā harore e taea ana te kai, me te mātakitaki manu. Ka mea ā, ka tupu ake te hiahia ki te whāwhā anō i ngā mahi whare wānanga. Ka tūmata a Leschen i tana tohu paerua i te Whare Wānanga o Arkansas (Fayetteville), me te uru ki ētahi mahi ka noho hei tūāpapa mō āna mahi e pā ana ki te whakarōpūtanga, te kunenga mai, me te taupuhi kaiao o ngā Coleoptera kai harore. He whakarārangi i ngā Coleoptera kai harore o Arkansas te aronga o tana Tohu Paerua. He nui te wā i pau i a ia ki te kohikohi pītara, me te whai kia taunga ia ki ērā o Amerika ki te Raki. Nō te otinga o tana Tohu Paerua, ka haere te tangata nei ki te Whare Wānanga o Kansas, ko tōna tikanga he whakarōpū i ngā Cryptophagidae tana kaupapa matua. Heoi anō, i pau te nuinga o ōna kaha ki te tirotiro i ētahi atu rōpū, tae atu ki ētahi atu o ngā Cucujoidea (hei tauira, ngā Erotylidae) me ngā Staphylinoidea (ngā scaphidiine staphylinid). He waimarie i riro i a ia tētahi tūranga kaitiaki tuarua i te Whare Mātai Pepeke o Snow. I taua tūranga ka whānui ake tana mōhio ki te tautohu, ki te whakarōpū i ngā Coleoptera o te ao nui tonu, ā, i āhei ia ki te kohikohi pītara puta noa i ngā whenua Rātini o Amerika. Ka whakawhiwhia anō hoki a Leschen ki ētahi pūtea i āhei ai ia ki te toro i ngā whare taonga maha o Amerika ki te Raki, o Ūropi, me ngā whenua Rātini o Amerika.

Ka rua tau ia e noho kore mahi ana, hāunga anō ētahi mahi whakaako i te whakarōpūtanga i te Whare Wānanga o te Rohe Nui o Michigan (i Lansing), kātahi ia ka tomo mai i Manaaki Whenua, i Tāmaki-makau-rau. Kei te āta whakapau kaha tonu ia ki te taha mātauranga o ngā whakapapa o ngā Coleoptera, ā, kei te whai wāhi tonu ki ngā mahi a te hunga mātai pītara i Aotearoa, i tāwāhi anō hoki. Ko tāna e tūmanako nei, kia puta he whakapapa pītara whaitake tonu ka tahi, kia whakatairangahia anō hoki ngā mahi rangahau i te ao tūroa, tae atu ki ngā mahi whakapapa, whakarōpū, ka rua. I tua atu i ēnei whāinga āna, kei te pūmau tonu tana ngākau nui ki te puoro tene kāore e uru mai te whakakaha ā-hiko. I tua atu i ēnei whāinga ōna, kei te pūmau tonu tana ngākau nui ki te puoro tene kāore e uru mai te whakakaha hiko, ki te tito waiata hoki, ko ētahi o ēnei waiata e taea te tirotiro i te pae tukutuku.

This column based on 2003 translation (*FNZ 47*) by **H. Jacob**  
Tāmaki-makau-rau / Auckland  
(haere tonu)

After a 2-year period of being unemployed and teaching systematics at Michigan State University (Lansing) he joined Landcare Research, Auckland. He maintains a high level of academic interest in Coleoptera systematics and involvement with the local and international beetle community; his main objectives being to produce useful beetle classifications and to promote the study of natural history, especially systematics and taxonomy. Apart from his systematics career, he maintains an interest in acoustic music and song writing, some which is available on the web.

### **Kupu Āwhina**

harore whata	bracket fungi
ngongo repe	glandular ducts
pineke kōtaha	laterally compressed
tāpuku	abdomen
tāwhana kāpeti	cabbage looper
toronga kōtaha	lateral extensions

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Translation by **W. Te Rākihawea**  
Ngaruawahia

## ABSTRACT

The fungus-feeding Erotylinae fauna of New Zealand are revised and a key to the adults and illustrations of key characters for all species are presented. Use of the aedeagal characters was facilitated by a chemical method that inflated the membranes of the internal sac. *Cryptodacne* Sharp, 1878 is redescribed and two new species are described: *Cryptodacne nui* n. sp., and *Cryptodacne rangiauria* n. sp. The following new synonymies are made: *Cryptodacne vagepunctatus* Broun, 1882 is synonymised under *Cryptodacne ferrugata* Reitter, 1879; *Cryptodacne vittata* Broun, 1886 is synonymised under *Cryptodacne synthetica* Sharp, 1878; and *Cryptodacne ocellaria* Broun, 1913 is synonymised under *Cryptodacne pubescens* Broun, 1893. Lectotypes are designated for *Engis politus* White, 1846 and *Cryptodacne ocellaria* Broun to fix the concept of each of the species to a single specimen. A new genus, *Kuschelengis* n. gen., is proposed with *Engis politus* White as the type species. *Engis politus* White, more commonly known as *Thallis polita* (White), becomes *Kuschelengis politus* (White), new combination. *Cryptodacnini* Sen Gupta, 1969 is synonymised with *Dacnini* Arrow, 1925.

A complete phylogeny of *Cryptodacne* shows that the species *C. brounii*, with an unknown distribution, is the sister taxon to the North Island *C. lenis*. The Chatham Islands endemic species *C. rangiauria* is the sister taxon to the mainland species *C. pubescens*, from coastal areas around the Cook Strait. Recent phylogenetic data for lineages containing Chatham Islands endemic species (or populations) show that the endemics are typically derived relative to other members of their clades. Identifying mainland source areas for species are complicated because of the lack of complete phylogenies for most groups. Nevertheless, half of the ancestral areas indicate source areas from the South Island. It is hypothesised that the ancestor of *C. pubescens* and *C. rangiauria* occupied areas that emerged after the transgression of the Manawatu Strait after the Pliocene submergence.

**Keywords.** Insecta, Coleoptera, Erotylidae, Erotylinae, Dacnini, *Cryptodacne*, *Thallis*, *Kuschelengis*, key, New Zealand, Chatham Islands, aedeagus, classification, cladistics, distribution, biology, fauna.

Skelley, P. E.; Leschen, R. A. B. 2007. Erotylinae (Insecta: Coleoptera: Cucujoidea: Erotylidae): taxonomy and biogeography. *Fauna of New Zealand* 59, 58 pp.

Received: 20 July 2005. Accepted: 14 March 2006.

## CHECKLIST OF TAXA

### Family Erotylidae

#### Subfamily Erotylinae

Genus <i>Kuschelengis</i> .....	14
<i>politus</i> (White) .....	14
Genus <i>Cryptodacne</i> .....	16
<i>brounii</i> (Pascoe) .....	17
<i>ferrugata</i> Reitter .....	18
<i>lenis</i> Broun .....	20

<i>nui</i> n. sp. ....	20
<i>pubescens</i> Broun .....	21
<i>rangiauria</i> n. sp. ....	22
<i>synthetica</i> Sharp .....	23

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## ACKNOWLEDGMENTS

We thank the curators of the private and institutional collections, who provided specimens and information for this study: D. Britton, Australian Museum, Sydney, N.S.W., Australia; A. Elipiński, Australian National Insect Collection, CSIRO, Canberra, A.C.T., Australia; A. Samuelson, Bernice P. Bishop Museum, Honolulu, HI, U.S.A.; D. Kavanaugh, California Academy of Sciences, San Francisco, CA, U.S.A.; W. Foster and R. Stebbings, Cambridge University Museum of Zoology, Cambridge, U.K.; A. Newton and P. Parrillo, Field Museum of Natural History, Chicago IL, U.S.A.; E. Sprecher, Frey Collection, Natural History Museum, Basel, Switzerland; O. Mörkl, Hungarian Natural History Museum, Budapest, Hungary; John T. Nunn, Dunedin, N.Z.; J. Marris, Entomology Research Museum, Lincoln University, Canterbury, N.Z.; M. Barclay, Natural History Museum, London, U.K.; N. Vandenberg, National Museum of Natural History, Smithsonian Institution, Washington, DC, U.S.A.; and D. Mann, Oxford University Museum of Natural History, Oxford, U.K.

We thank Russell Stebbings, Cambridge University, for providing images of Crotch's specimens of *Engis politus* which helped us to designate the lectotype. Many localities for the distribution maps were located with the database and maps available at <http://www.wises.co.nz>. We thank them and all other internet resources utilised in this study (e-mail is great!). Birgit Rhode and Grace Hall helped with imaging and data entry. Without them, this collaborative work would have taken much longer to finish.

Thomas Buckley, John Lawrence, Bernard Michaux, John Marris, and Rosa Henderson provided reviews of this paper. This is Florida Department of Agriculture and Consumer Services, Division of Plant Industry, Entomology Contribution No. 1004. Funding for this project was supported in part by FRST (contract C09X0501).

## INTRODUCTION

In *Fauna of New Zealand* 47, Leschen (2003) restructured the family Erotylidae to include the family Languriidae (see also Wegryznowicz 2002) and examined the status of the higher taxa based on a cladistic analysis of adult characters. He also reviewed the New Zealand species that would have been included in the former family Languriidae. The purpose of this paper is to complement Leschen's (2003) review of New Zealand's Erotylidae by covering the species of subfamily Erotylinae. The Erotylinae, also known commonly as the "pleasing fungus beetles" for their often striking colours (which do not occur in New Zealand species), are represented in New Zealand by two genera, one of which is endemic with several species. Various authors have described erotyline species, or created lists for them, but none has attempted to evaluate these taxa and update their taxonomy.

Early collections of the erotyline fauna followed the standard tradition for the British Empire whereby expeditions or colonists provided specimens for enthusiastic European workers. Among these were two New Zealand entomologists, Thomas Broun and Richard Helms, who provided or described much of the Erotylinae material used to define the fauna. Thomas Broun not only described thousands of beetle species, but in a long series of works, also attempted to list the beetle fauna of New Zealand.

The first New Zealand erotyloid species described was *Engis politus* White, 1846, later transferred by Crotch (1876) to the genus *Thallis* Erichson. White's description is very short, lacking data such as length, but a type exists and was available for this study. Next came the descriptions of species in *Cryptodacne* Sharp, 1878: *Triplax brounii* Pascoe, 1876, *Cryptodacne synthetica* Sharp, 1878, and *Cryptodacne ferrugata* Reitter, 1879. Following these species, came Broun's works describing *Cryptodacne lenis* Broun, 1880, *Cryptodacne vagepunctata* Broun, 1882, *Cryptodacne vittata* Broun, 1886, *Cryptodacne pubescens* Broun, 1893, and *Cryptodacne ocularia* Broun, 1913. Broun also covered species of earlier workers by reprinting, or translating, the original work. One species listed by Reitter (1879: 183) and Broun (1910: 78) as an erotyloid is *Tritomidea rubripes* Reitter, 1879, which was transferred to the family Cerylonidae by Slipinski (1990: 70) under the genus *Hypodacnella* Slipinski.

The only larval work has been the description of *Cryptodacne synthetica* by Sen Gupta (1969) where also the tribe Cryptodacnini is defined, presumably only for *Cryptodacne*, in his classification for the family. Lawrence (1988) also commented on the larval characters of *Cryptodacne* compared with Australian *Cnecosa* Pascoe and other Dacnini.

Based on adult characters, all members of the Erotylinae in New Zealand belong in the tribe Dacnini, a placement that is firmly established (Wegrzynowicz 2002, Leschen 2003). Continued retention of a single genus tribe based on a few larval characters is not advised. Thus, the Cryptodacnini are here considered synonymous with the Dacnini. However, the relationships of dacnine genera to one another around the world are not well understood. A more thorough cladistic analysis of the Dacnini is needed to gain a better understanding of this mainly Gondwanan tribe.

Most New Zealand species of erotylines are fairly widespread, and all, apart from two species, are found in both islands. We describe a new species, *C. rangiauria*, which is restricted in distribution to the Chatham Islands, located some 800 km east from the coast of the South Island. There is some controversy about the origin of the Chatham Islands fauna, mainly relating to whether the taxa arrived there by dispersal, or whether the fauna was isolated through vicariance (Trewick 2000). One test of the dispersal theory is to determine the phylogenetic relationships of *Cryptodacne* and the relationship of *C. rangiauria* to other members of the genus. A basal position in the tree, as sister taxon to the remaining members of the genus, could indicate a vicariant event that separated *C. rangiauria* from the rest of New Zealand taxa, whereas a more derived position could represent a dispersal event. Source areas of the Chatham Islands have not been adequately identified and we attempt to determine whether these are in the South Island, North Island, or both (Craw 1988, 1989; Emberson 1995, 1998) by examining all the available phylogenetic information for plants and animals.

The phylogeny of *Cryptodacne* may also help determine the taxonomic status of the species *C. brounii*, which is very similar to the species *C. lenis*. *Cryptodacne brounii* is known from two specimens described by Pascoe (1876) from 'Auckland,' and placing this species in the phylogeny of the genus may provide clues to its validity as a species.

## MATERIALS AND METHODS

**Material examined.** Material used in this study (listed in the Appendix) are deposited in the following collections and in the care of the curators listed:

- AMSA Australian Museum, Sydney, N.S.W., Australia, D. Britton  
 ANIC Australian National Insect Collection, CSIRO, Canberra City, A.C.T., Australia, A. Slipinski  
 BPBM Bernice P. Bishop Museum, Honolulu, HI, U.S.A., A. Samuelson

- CASC California Academy of Sciences, San Francisco, CA, U.S.A., D. Kavanaugh  
 CUMZ Cambridge University Museum of Zoology, Cambridge, U.K., W. Foster and R. Stebbings  
 FMNH Field Museum of Natural History, Chicago IL, U.S.A., A. Newton and P. Parrillo  
 FREY Frey Collection, Natural History Museum, Basel, Switzerland, E. Sprecher  
 HNHM Hungarian Natural History Museum, Budapest, Hungary, O. Mörkl  
 JNIC John T. Nunn collection, Dunedin, N.Z.  
 LUNZ Entomology Research Museum, Lincoln University, Canterbury, N.Z., J. Marris  
 NHML Natural History Museum, London, U.K. (formerly BMNH), M. Barclay  
 NMNH National Museum of Natural History, Smithsonian Institution, Washington, DC, U.S.A., N. Vandenberg  
 NZAC New Zealand Arthropod Collection, Auckland, N.Z., R. A. B. Leschen  
 OXUM Oxford University Museum of Natural History, Entomology, Oxford, U.K. (formerly HCOE), D. Mann  
 PESCE Paul E. Skelley collection, Gainesville, FL, U.S.A.

**Type Specimens.** The types for many previously described species are located in the Natural History Museum, London, which houses the collections of Pascoe, Sharp, and most of the Broun collection (Horn *et al.* 1990). Reitter's collection was split and the type of *C. ferrugata* Reitter may be in the A. Grouvelle collection, currently housed at the Museum National d'Histoire Naturelle, Paris (Horn *et al.* 1990), but the specimen could not be located. White's species was located in Crotch's Erotylidae Collection at Cambridge University.

Lectotypes were designated where the literature, available specimens, or label data presented an unclear case of which specimen was the "type". These lectotypes are here designated to fix the identity of the species to a single specimen (ICZN 1999, Art.74.7.3). Where possible, type data for all species are presented to aid future researchers in locating and recognising primary types, or the specimens on which the present concept is based. Details are presented in the text under the species in question. In the type label notation, "/" is used to separate labels.

**Specimen preparation.** Many specimens required cleaning and remounting. Specimens remounted on card stock were glued with a water-soluble glue. Specimens remounted on points were fixed in place with glues which are soluble in either water or 95% ethanol. Dissected genitalia were

placed in a drop of dimethyl hydantoin formaldehyde (DMHF) on a card mount usually separate from the remainder of the body as a means of preparation. The medium DMHF is soluble in water. Supplemental material was completely slide-mounted or kept in glycerin using the methods listed in Leschen (2003). Specimens chosen for genitalic dissection came from across the range of distribution and character variation of all species, and included most of the type specimens. Sexual dimorphism was noted in several species, although it is quite subtle in some. The degree of dimorphic male development varied between species, but not much occurs within species.

**Examination of the internal sac.** An interesting phenomenon occurred during preparation of many male genitalic dissections. When the aedeagus was removed from the KOH solution used for clearing, or from the DMHF, and placed in a drop of water, the internal sacs inflated. Transferring the genitalia briefly into a KOH solution and back into water frequently aided in this inflation. Apparently, the tissues were intact and, it is suspected, there was some blockage through the medial lobe which created diffusion pressures inflating the internal sac, allowing a detailed examination of its structures. Without this, species recognition would have been nearly impossible. This phenomenon needs to be studied further to determine its potential use in the study of other erotyliids.

**Images.** Scanning electron micrographs were taken of uncoated specimens at low acceleration voltages (1.5–5.0 kv) with a JEOL JSM-5510LV. Thus, we were able to acquire quality images of all type specimens studied and make detailed studies of their external morphology. This aided tremendously in character evaluations.

**Morphological terms.** Where possible, structural names used here follow the definitions outlined in Leschen (2003), otherwise we follow McHugh *et al.* (1997) or Boyle (1956). Structures discussed below are labeled in the figures of the ventral body (Fig. 3) and male genitalia (Fig. 24). A list of important features used in the keys and in the cladistic analysis follows (a more complete list of morphological terms is provided by Leschen 2003):

**Aedeagus:** male intromittent organ of the cucujoid type (Crowson 1955) (Fig. 24) consisting of a tegmen and a median lobe (or penis) with an internal sac (with a flagellum, sclerotised base, and dorsal and ventral lobes), and a median strut. The tegmen is not useful for species identification.

**Gula:** ventral region of the head (see Fig. 12).

**Legs:** consisting of the basal coxa (with a small trochantin that is hidden), a short trochanter, elongate femur and tibia, and 5-segmented tarsus; the prolegs (first pair of legs) may be variable in shape between the sexes; the

profemur and protibia of males may have tubercles on the inner margin.

**Maxilla:** appendage located below the mandible consisting of an inner galea and lacinia and outer palp of 3 segments, the terminal palpomere is dilated in *Cryptodacne* (see Fig. 13).

**Mesoventrite:** ventral portion of the mesothorax (Fig. 15).

**Metaventrite:** ventral portion of the metathorax which articulates anteriorly with the mesoventrite and posteriorly with the first ventrite of the abdomen; mesosubcoxal lines (or femoral lines) are present posteriorly to the mesocoxae in most species (see Fig. 17).

**Ocular line:** distinct lines, carinae or grooves located just dorsal to the eyes on the vertex of the head, which may extend along the lateral edges anteriorly or posteriorly.

**Ovipositor:** female genitalia involved in egg laying (Fig. 32).

**Pronotum:** dorsal portion of the prothorax consisting of a disc (entire portion of the pronotum above the carina) with well developed posterior and anterior angles; the lateral margin or lateral carina is smooth, a well developed marginal or basal bead or raised rim may be present. A longitudinal median strip that lacks punctures is diagnostic for some *Cryptodacne*.

**Prosternum:** the anterior and mesal walls of the coxal cavity (Fig. 19); the prosternal process is variable at the apex (it may be bilobed, weakly convex, or truncate apically).

**Punctures:** shallow pit-like impressions which extend into the cuticle and are often marked by a seta and/or a pore.

**Setae:** hair-like extensions of the cuticle which tend to be erect or suberect.

**Distributions.** Geographic distribution is recorded based on the codes developed by Crosby *et al.* (1998).

**Species recognition.** To determine the limits of *Cryptodacne* species we followed the phylogenetic species definition as outlined by Wheeler & Platnick (2000): "A species is the smallest aggregation of (sexual) populations or (asexual) lineages diagnosable by a unique combination of character states." External morphological characters were used to identify what we hypothesised were species, but some of these characters were highly variable (e.g., setation, punctuation). After dissection of specimens of *Cryptodacne*, it was clear that there were seven distinct species based on invariant male genitalic characters. For some species, females without associated males or females which lacked adequate label data were impossible to identify with confidence.

## IDENTIFICATION OF EROTYLIDAE AND KEY TO EROTYLINAЕ OF NEW ZEALAND

The erotyloid subfamilies have been keyed and diagnosed by Leschen (2003), and the erotylinae treated here can be distinguished from all other erotyliids in New Zealand by the prothorax with distinct anterior angles projecting forward and the procoxal cavities completely closed externally by lateral extensions of the prosternal process and the hypomerion (Fig. 3). They also tend to have more convex bodies that are larger in size than most other New Zealand erotyliids. Note that the families Languriidae and Erotylidae were treated separately in Klimaszewski & Watt (1997).

The following key to the species of Erotylinae occurring in New Zealand can be used in conjunction with the key to the remaining species of Erotylidae provided in Leschen (2003: 44). External characters are used in the key where possible, though internal characters are included because oftentimes these are the only characters that can be used to identify similar and sympatric species, like *C. ferrugata* and *C. pubescens*. The setal character in couplet 2 is effective, even in specimens where the setae on the elytral disc have been rubbed off because setae are still present on the lateral surfaces. It is best to observe setae with oblique or diffused lighting.

- 1 Terminal palpomere of maxilla narrowed and not dilated (Fig. 19); basal margin of pronotum complete (Fig. 1, 4) ..... (p. 14)... *Kuschelengis politus* (White)
- Terminal palpomere of maxilla dilated (Fig. 20–21); basal margin of pronotum interrupted at middle (Fig. 5–11) ..... [*Cryptodacne* spp.] 2
- 2(1) Elytral surface with setae short, barely projecting out of punctures, setae not or weakly curved (Fig. 5, 7, 8) ..... 3
- Elytral surface with setae elongate, numerous, distinct, usually long enough to appear curved (Fig. 6, 9–11) 5
- 3(2) Body length > 5.5 mm; pronotum slightly wider than long (Fig. 8); pronotal or elytral setae very short and visible under high magnification ..... (p. 20)... *C. nui* n.sp.
- Body length < 5.2 mm; pronotum wider than long (Fig. 5, 7); pronotal and elytral setae short and visible under low magnification ..... 4
- 4(3) Pronotum without medial glabrous strip (Fig. 5); body length < 3.6 mm; male genitalia with sclerotised base of flagellum 2x longer than wide (Fig. 25) ..... (p. 17)... *C. brounii* (Pascoe)

- Pronotum with medial glabrous strip (Fig. 7); body length > 3.5 mm; male genitalia with sclerotised base of flagellum about 3x longer than wide (Fig. 27) ..... (p. 20)... *C. lenis* Broun
- 5(2) Subocular line short, less than half length of eye (Fig. 13); apex of prosternal process truncate (Fig. 20); Chatham Islands ..... (p. 22)... *C. rangiauria* n.sp.
- Subocular line long, about 0.50 to 0.75× length of eye (Fig. 14); apex of prosternal process bilobed (Fig. 21, 15–16); mainland New Zealand ..... 6
- 6(5) Body dark, usually with a colour pattern (Fig. 2); majority of elytral pubescence short, reaching next puncture at most (Fig. 11); mesoventrite without median ridge, with or without a single large depression at middle (Fig. 16); metaventrite usually with lateral submesocoxal line long, distinctly reaching or surpassing middle of coxae (Fig. 18); male protibia narrowed basally and bent at middle (Fig. 23) ..... (p. 23)... *C. synthetica* Sharp
- Body unicolourous reddish-brown (without colour pattern); majority of elytral pubescence reaching or surpassing next puncture (Fig. 6, 9); mesoventrite usually with a median longitudinal ridge separating two impressed areas (Fig. 15); metaventrite with lateral subcoxal line absent or short, at most reaching lateral margin of mesocoxa (Fig. 17); male protibia weakly narrowed and not distinctly bent ..... 7
- 7(6) Male genitalia (Fig. 26) with internal sac bearing 2 sclerotised ventral lobes and large ventral patch of microsetae; sclerite at base of flagellum with diverging dark lines in dorsal view; elytral setae variable in density, usually sparse (Fig. 6; note that populations from the southeastern part of the South Island have dense setae); elytral setae golden in colour; prosternal process with sides and coxal lines weakly arched but basically parallel; widely distributed (Map 2) ..... (p. 18)... *C. ferrugata* Reitter
- Male genitalia (Fig. 29) with internal sac lacking ventral lobes and with a small ventral patch of microsetae; sclerite at base of flagellum bearing parallel dark lines in dorsal view; elytral setae usually dense (Fig. 9) and usually silver in colour; prosternal process with sides and coxal sides nearly straight, parallel, or strongly divergent posteriorly; present in the southeast of the North Island and mainly in the northeastern portion of the South Island (Map 5) ..... (p. 21)... *C. pubescens* Broun

## DESCRIPTIONS

### *KUSCHELENGIS* new genus

**Type Species.** *Engis politus* White, 1846, by monotypy.

**Diagnosis:** *Kuschelengis* is the only member of Dacnini with the marginal bead at the pronotal base fine and complete (distinctly wider at middle in *K. politus*), the basal groove ("antesulcus") next to bead narrow and shallow, and the pronotum and elytra discs are glabrous and finely punctate. Some members of other dacnine genera have a complete, uniform width basal bead, but the groove separating it from the pronotal disc is deep and broad, and the pronotum and elytra are strongly punctate and often setiferous. Additionally, other Austral taxa examined have a scutellary striole which is absent in *Kuschelengis* and *Cryptodacne*.

**Description:** With the characters of Dacnini. Body elongate, but not parallel-sided, lacking distinct dorsal setation and colour pattern; punctures of pronotum and elytra fine; basal margin of pronotum fine, complete, widely separated from edge in front of scutellum; marginal bead at base of elytra complete from lateral angle to scutellum, scutellary striole absent; apical maxillary palpomeres acuminate; prosternal process apically broad, truncate, and not projecting nor lobed; mesoventrite broad, flat; tarsi all distinctly pentamerous.

**Distribution.** *Kuschelengis* is presently only recognised by a single species, which we redescribe from New Zealand, although there are several undescribed species from New Caledonia that will be studied at a later date.

**Comments.** Only a brief description is provided for the genus *Kuschelengis* because it belongs to a complex of Australasian Dacnini genera related to the genus *Thallis* Erichson, which requires detailed study and is beyond the scope of our study. According to Chûjô & Chûjô (1988), the 22 species of *Thallis* are primarily Australian with others in the Moluccas, New Zealand, and New Caledonia. Groups of species presently in *Thallis* are divergent in numerous important characters that are probably apomorphic and may indicate the genus requires further splitting. Previously, for example, Lawrence (1988) recognised and removed the genus *Cnecosa* Pascoe from within this assemblage. *Kuschelengis* has several characters (e.g. dorsal surfaces lacking setae, pronotal basal margin present without a deep antesulcus, scutellary striole absent or very weakly impressed) indicating that it may be distantly related to some members of *Thallis*, especially with reference to the type species *Thallis janthina* Erichson.

Based on numerous characters (genitalic, body shape, body sculpture, etc.) *K. politus* seems most closely related to species in New Caledonia (*Thallis nigroaenea* Crotch,

*Thallis signata* Fauvel). These are not yet considered members of *Kuschelengis* because any transfer should await a more detailed analysis of the *Thallis* group to better define generic limits within the tribe.

**Etymology.** Named to honour Dr G. (Willy) Kuschel for his many years of work on New Zealand beetles.

### *Kuschelengis politus* (White), new combination

Fig. 1, 4, 12, 19, 31, 33 Map 1

*Engis politus* White, 1846: 18.

*Thallis polita* (White), Crotch 1876: 400.

*Kuschelengis politus* (White), **new combination.**

**Diagnosis.** *Kuschelengis politus* is unique among New Zealand erotylines due to its narrowed maxillary palpi and entirely margined pronotal base.

**Description.** Length 4.32–5.76 mm. Width 1.84–2.40 mm. Body (Fig. 1) elongate, but not parallel-sided, lacking distinct dorsal setation; body black in mature specimens, nitid; antenna, legs and apex of abdomen red, always lighter in colour than body.

Head wedge-shaped; labrum visible; epistome truncate, lacking marginal line; supraocular stria present, extending from base of eye to anterior margin of antennal base; stridulatory files not observed in either sex; surface finely punctate, setae short, barely projecting out of puncture. Eyes large, protruding, moderately coarsely faceted. Antenna barely reaching pronotal base, basal antennomeres almost moniliform, antennomere III 1.5× longer than antennomere II; club 3-segmented, each segment as long as antennomere III and 2.5–3.0× wider; apex of antennomeres IX–X with apical ring of sensillae; antennomere XI asymmetrically rounded, somewhat triangular, but not pointed.

Pronotum with lateral edges arcuate, widest near base, lateral marginal bead fine; apical edge emarginate behind eyes, projecting over head at middle, marginal line present only behind eyes; basal edge sinuate, somewhat lobed at middle, prebasal marginal line complete and distant from edge at middle; surface finely punctate, separated by 4–6 puncture diameters.

Scutellum pentagonal, width 1.5× length. Elytra about 2.5× longer than pronotum, with complete marginal line at base; scutellary striole apparently absent; other striae indicated with slightly larger punctures, which apparently lack setae.

Head curved ventrally (Fig. 19) just in front of posterior tentorial pits, laterally gena with coarse punctures same size as ocular facets, each bearing a short seta; subocular lines present, extending full length of eye, continuous across genal spine with medial extension complete across middle as a transverse gular groove. Submentum broad, 3.5× wider

than long, lacking marginal line anteriorly. Mentum broad, 2× wider than long, entire structure somewhat trapezoidal, bearing a ridge with a medial projection enclosing a broad, triangular area at base. Maxillary palpi with terminal segment acuminate, width 0.75× length, sensory apex held medially at rest. Labial palpi with terminal segment weakly dilated, apical sensory area weakly elongate. Mandibles somewhat flattened, with 2 apical teeth and a large setose lateral area.

Prosternum (Fig. 19) slightly wider than long, length of prosternum in front of procoxae as long as prosternal process; anterior edge not projecting, with two complete marginal lines; prosternal process with lateral lines near coxae, line lacking on apical edge which is broadly rounded, almost truncate; lateral punctures of prosternum weak to absent; punctures of prosternal process equal to a facet in size, but weakly defined; all punctures bearing a short seta. Mesoventrite with posterior edge forming an anteriorly arched suture with metaventrite, length of suture about equal to width of mesocoxa; coarsely punctate laterally, with punctures equal in size to two ocular facets; disc of mesoventrite usually enclosed laterally by shallow grooves (= coxal lines), lines weakly defined, occasionally arching and connected anteriorly; medial area delineated by these lines with a few fine punctures. Metaventrite 1.5× wider than long; with mesosubcoxal line not connecting medially, continuous behind mesocoxa, not extending onto disc; subcoxal line of metaventrite distinct to lateral angle and extending 1/2 length of metaventrite along lateral margin; finely punctate at middle with few indistinct coarse punctures laterally.

Abdomen with basal ventrite broad and truncate between metacoxa; subcoxal lines present, not extending onto disc, continuous behind metacoxa; abdominal punctures fine, evenly distributed in no notable pattern. Legs with femur elongate, widened at middle, lacking marginal line along inner edge; tibia not widened apically. Profemur and protibia sexually dimorphic, male with protibia slender, arched and bearing 2 rows of tubercles along inner edges, femur with corresponding rows of tubercles; female with tibia not as slender, weakly arched and lacking tubercles. Tarsi distinctly pentamerous; tarsomeres I–III with patch of setae ventrally; tarsomere III weakly expanded ventrally, but not lobed; tarsomere IV with 2 setae.

Genitalia of female (Fig. 33) with stylus apparently lacking, coxite pointed terminally, awl-like, length nearly equal to valvifer; paraproct narrowed apically; abdominal segment IX with microsetae and paired patches of asperites at base; sternite VIII elongate, slightly wider than long. Male (Fig. 31) with sternite IX narrowly rounded; lateral lobes of tegmen long, pointed, with ventral setae on apical half; median lobe laterally flattened at apex, weakly cylindrical at base; internal sac evenly covered with

microsetae; dorsally with a long, darkened, apically bilobed process that may act as a guide for the flagellum, which is slightly longer than medial lobe, thickened entire length; sclerotization at base of flagellum heart-shaped.

**Type material examined.** Two cotypic specimens of *Kuschelengis politus*, on a single card mount, are labelled: “/ [blue paper] COTYPES/ TYPE. polita White Pt. Nicholson/ [red paper] LECTOTYPE *Engis polita* White des. P.E.Skelley/ *Kuschelengis politus* (White) det. P.E.Skelley/” (CUMZ), sex undetermined, right specimen here designated as lectotype.

**Material examined.** A total of 72 specimens were studied; with 6 males and 2 females dissected for genitalia. Data for material are provided in the Appendix.

**Distribution** (Map 1). Widespread in the North Island and its offshore islands and occurring in the northernmost areas of the South Island

North Island: AK, BP, CL, ND, WN, RI. South Island: BR, NN, SD.

**Comments.** ‘*Thallis polita*’ is species number 1125 in Broun’s catalogue/manual (see May 1967). White (1846) indicated the name ‘*Engis politus*’ was a manuscript name of Hope’s and made no mention how many specimens were studied, but stated the specimen(s) were in the “Mus. Parry”. Type specimens were found in the Crotch erolytid collection at Cambridge. Crotch’s collection was partly created by purchase of earlier workers’ collections, and is rich in erolytid types. Crotch clearly labeled his material to indicate which ones he considered types and which ones were not (Skelley 1998). Labels on Crotch’s specimens indicate they are cotypes. Two specimens are on the same card mount; one intact, one severely damaged and missing body parts. The intact specimen (on the right) is here designated as the lectotype to preserve the stability of nomenclature by selecting one specimen as the sole, name-bearing type. The second damaged specimen is considered a paralectotype, but no additional label is placed on the pin because of its damaged state.

Chûjô (1964: 226) stated the record for ‘*Thallis polita*’ in Taiwan by Kano (1931: 172) was a misidentification because the species is clearly endemic to New Zealand. Or, the record is based on a specimen from the Shiraki collection which is reported to have many exotic specimens mislabeled as being from Taiwan (Chu & Hsiao 1981). Either way the record is in error.

Biological data on labels are sparse, but indicate *K. politus* has been collected from tunnels in *Leptospermum scoparium*, in fallen nikau sheath, on tree trunks at night in bush remnant along banks of Opanuku stream, on *Cordyline australis*, on dead standing *Corynocarpus laevigatus*, on rotten logs at night, under bark of rotten log in mixed

broadleaf/podocarpus forest, and in the bole of a dead cabbage tree. Hudson (1934: 55, as *Thallis polita*) states it is "Found amongst bark and dead leaves, but not often met with. Apparently mainly attached to hinau." Kuschel (1990) listed this species from "decayed wood and in mould of large, hollow *Vitex* trees." As with many members of erotylineae, it is suspected that *K. politus* feeds on bracket fungi growing on dead wood and is nocturnal and the only fungal host is *Auricularia polytricha* (Basidiomycetes), a common wood rotting fungus.

**Additional references.** Broun 1880: 643; Chûjô & Chûjô 1988: 152; Gemminger & Harold 1876: 3686; Kuhnt 1909: 102; 1911: 72.

**Fungal host.** *Auricularia polytricha* (Auriculariales).

### CRYPTODACNE Sharp

*Cryptodacne* Sharp 1878: 82–83.

**Type species.** *Cryptodacne synthetica* Sharp 1878: 82–83, by monotypy.

**Diagnosis.** *Cryptodacne* (New Zealand) and *Cnecosa* (Australia) are readily recognised from all dacnine genera by the presence of dilated maxillary palpi. *Cryptodacne* differs from *Cnecosa* in being flightless and having the mentum not excavated for reception of the maxillary palpi.

**Description:** Length 2.88–6.72 mm. Width 1.12–2.56 mm. Body (Fig. 5–11) elongate, tapering at both ends, weakly flattened; dorsal setation variable; dark brown to red-brown to tan; some darker species with colour patterns, having lighter edges around pronotum and elytra.

Head wedge-shaped, epistomal margin truncate; labrum visible; supraocular stria present from base of eye past base of antenna, not reaching lateral angle of epistome; base with series of coarse punctures, hidden under pronotum when head retracted; paired stridulatory files present on male, apparently absent on female; surface with sparse punctures, denser on clypeus, each bearing a long seta. Eyes large, rounded and coarsely faceted, protruding, in some almost raspberry-like. Antenna not reaching base of pronotum, basal antennomeres almost moniliform, antennomere III 1.5–2.0× longer than antennomere II; club 3-segmented, each club segment as long as antennomere III and 2.0–3.0× as wide, weakly flattened, antennomeres IX–X with terminal ring of sensillae, antennomere XI triangular with apex slanted, pointed apically.

Pronotum usually wider than long, lateral edge arcuate, widest in middle; base weakly sinuate, lobed over scutellum; anterior edge strongly emarginate over eyes and lobed at middle, lobe projecting slightly over head; apical marginal bead present only near lateral angles; basal marginal bead present near lateral angles or extending medially, but not

present in medial 1/3 near scutellum; surface of pronotum with fine to coarse punctures, scattered and never dense, frequently occurring in 2 longitudinal patches with a bare area along midline; setae of pronotal punctures vary in length depending on species.

Scutellum pentagonal, width 1.2–2.0× length. Elytra about 2× longer than pronotum, widest at basal 1/3; basal marginal bead present, strongest laterally, absent in medial 1/3; disc covered with punctures, each bearing a seta, setal length varies from short to long depending on species; punctures arranged in longitudinal rows which correspond to striae with a single row of punctures between each pair of striae; striae puncture larger than interstriae punctures in some, usually indistinguishable; scutellary striae apparently absent; epipleural fold present, nearly reaching apex. Wings reduced to straps with apical binding patch, elytra not fused.

Head (Fig. 20–21) ventrally angled along base in front of posterior tentorial pits; laterally gena with coarse punctures 0.5–1.0× ocular facet size, each bearing a long seta; subocular lines present, usually extending full length of eye, not extending onto genal spine; transverse gular groove obliterated medially, present at each side by a deep pit at the medial end of a line on inner edge of genal spine. Submentum broad, 3.5–4.0× wider than long, margin complete anteriorly. Mentum broad, 2.0–2.5× wider than long, entire structure somewhat trapezoidal, bearing a ridge with a medial projection enclosing a broad, triangular area at base; apical half of mentum, anterior to ridge, depressed and flattened, not deeply excavate and pit-like. Maxillary palpi with terminal segment broadly dilated, width 2.0× length, sensory apex held medially at rest. Labial palpi with terminal segment weakly dilated, apical sensory area elongate. Mandibles somewhat cup-shaped, with 2 apical teeth and a large setose lateral area.

Prosternum (Fig. 20–21) slightly wider than long, anterior prosternum longer than prosternal process; anterior edge not projecting, with complete marginal bead; prosternal process with lateral lines near coxae (frequently weak and indistinct), line lacking along apical edge which is usually emarginate at middle creating a bilobed appearance; lateral punctures larger than ocular facet, separated by 1.0–2.0 diameters; punctures of prosternal process fine or lacking; all punctures bearing a seta. Mesoventrite with posterior edge forming an anteriorly arched suture with metaventricle, length of suture greater than width of mesocoxa; coarsely punctate laterally, with punctures equal in size to one ocular facet; disc of mesoventrite usually enclosed laterally by shallow grooves (= coxal lines), lines often weakly defined, often arching and connected anteriorly; medial area delineated by these lines with fine punctures. Metaventricle 2× wider than long; with submesocoxal lines connecting

medially or not, broken behind mesocoxa but not extending far onto metaventrite disc; submesocoxal line distinct at lateral angle, not extending along lateral margin; finely punctate medially, becoming coarse laterally.

Abdomen with basal ventrite broad and truncate between metacoxa; subcoxal lines not extending onto disc, broken or not behind metacoxa; abdominal punctures not as coarse as lateral metaventrite punctures, evenly distributed with no notable pattern. Legs with femur elongate, weakly widened at middle, lacking line along inner edge; tibia weakly widened apically. Profemur and tibia sexually dimorphic in some species, males with protibia slender, weakly arched and bearing tubercles along inner edges, femur often with corresponding tubercles; females lack these modifications; degree of development variable between species, often indistinct. Tarsi distinctly pentamerous; tarsomeres I–III with patch of setae ventrally; tarsomere III weakly expanded ventrally, but not lobed; tarsomere IV with 2 setae.

Genitalia of female (Fig. 32) with reduced stylus; coxite truncate and flattened terminally, chisel-like, length nearly equal to valvifer; paraproct narrowed apically with small projection; abdominal segment IX with basal patch of microsetae, not organized in any pattern; sternite VIII elongate, slightly wider than long. Male (Fig. 24–27, 29–31) with sternite IX apically rounded, truncate, or bilobed; lateral lobes of tegmen (parameres) long, pointed, with ventral setae on apical half; median lobe laterally flattened at apex, much more cylindrical at base; median strut 2.0–2.5× longer than median lobe; internal sac with variable patches of microsetae; dorsally with a fleshy bilobed process that may act as a guide for the flagellum; most species with a ventral pair of lobes that may also act as a flagellar guide; flagellum present, thin, usually much shorter than medial lobe; sclerotization at base of flagellum usually broad and oval.

**Distribution.** *Cryptodacne* is endemic to New Zealand.

**Comments.** Although listing *K. politus*, under the genus *Thallis*, the catalogue of Chûjô & Chûjô (1988) did not include the genus *Cryptodacne*.

*Cryptodacne* shares certain mouthpart characters with *Cnecosa* that are unique among the Erotylidae: a dilated terminal joint of the maxillary palp for which the sensory surface is held medially at rest. In all other erotylids with dilated palps, the sensory surface is directed externally (anteriorly or laterally) at rest. While dilated palpi are characteristic of other erotylid groups, having the sensory surface held medially is characteristic of the more basal lineages (like dacnines and megalodacnines). This adult character is apparently apomorphic for a distinct lineage, but many other characters place these genera solidly in the Dacnini (Wegrzynowicz 2002, Leschen 2003). SenGupta

(1969) erected the tribe Cryptodacnini for *Cryptodacne*, but all current evidence shows this creates a paraphyletic Dacnini. Thus, we formally synonymise Cryptodacnini with Dacnini, **new synonymy**.

Biological information contained on label data and the presence of coarsely faceted eyes suggest that *Cryptodacne* species are nocturnal. Sparse biological information indicates that the species feed on polypore fungi (bracket fungi) associated with decaying wood. Being flightless, it is suspected that they would only be able to survive in areas where appropriate food sources are not too widely spaced, nor too ephemeral. Old mesic woodlands, cloud forests, or riparian zones may harbour populations of this genus. Much still needs to be learned about their biology and distribution.

**Additional references.** Broun 1880: 640–641 [reproduction of Sharp's description].

### *Cryptodacne brounii* (Pascoe)

Fig. 5, 25

*Triplax brounii* Pascoe, 1876: 60

*Cryptodacne brouni* [sic] (Pascoe), Arrow 1909: 196.

**Diagnosis.** *Cryptodacne brounii* is recognised by its small body size, dark colour, evenly distributed pronotal punctures, and male genitalia. It is most similar morphologically to *C. lenis*.

**Description.** Length 3.36–3.60 mm. Width 1.52–1.68 mm. Body (Fig. 5) dark brown; legs, lateral pronotum, elytral humeri and apex slightly paler. Pronotum and elytra with fine punctures evenly distributed; each puncture with short seta, barely visible, barely reaching out of puncture. Pronotal length 0.75× width, widest behind middle. Head with subocular line long, 0.75× length of eye, base separated from eye by distance less than one ocular facet. Prosternal process with apex strongly bilobed, sides and coxal lines arched, but basically parallel. Mesoventricle disc enclosed laterally by shallow grooves (= coxal lines), lines connecting anteriorly at midline, area between lines depressed and flat. Metaventrite with submesocoxal line at antero-lateral angle short behind mesocoxa, barely attaining outer mesocoxal margin.

Male protibia weakly curved at middle and weakly narrowed at base, tubercles not readily visible. Female unknown.

Male genitalia (Fig. 25): internal sac with small ventral lobes, much smaller than dorsal lobe; microsetae generally distributed, with a band of long setae near middle; flagellum much shorter than median lobe, slender, relatively straight but angled at base; flagellar base large, darkened, length just under half entire length of flagellum, parallel sided, length of sclerotised widened part at base nearly equal to width;

internal sac not extending anterior to flagellar base.

**Type Material examined.** Only two syntypic specimens were studied. The holotype is labelled: “/ [on card mount] Type ? / [red ringed disc] Type / [hand written] Triplax brouni / N. Zealand / Pascoe Coll. 93–60 / [red paper] HOLOTYPE *Cryptodacne brounii* (Pascoe), det. P. E. Skelley” (NHML), male. The male paratype is on the same pin as the holotype.

**Distribution.** Pascoe (1876) stated the specimens are from Auckland, a more precise locality is unknown. However, in 1876, ‘Auckland’ could mean anywhere from an area extending from north of Auckland to about half way down to the central portion of the North Island, referred to as the Auckland Province.

**Comments.** *Cryptodacne brounii* is species number 1124 in Broun’s catalogue/manual. Pascoe (1876) made no indication in the description as to how many specimens were studied, nor where they were deposited. Pascoe’s collection, deposited in the NHML (Horn et al. 1990), had one card mount of *C. brounii* with two specimens, clearly syntypic. However, Pascoe had written “Type” on the bottom of the card beneath the left specimen. This clearly indicated Pascoe’s holotype and paratype. They were removed and mounted on separate cards, on which is written ‘type’ or ‘paratype’ to identify them. They were then placed back on a single pin with the original card mount and labels. Coloured type labels were added to clearly identify the specimens.

The names, *brounii* vs. *brouni*, have been variably used in some references. Pascoe (1876) originally spelled the name ‘*brounii*’. The rules of Latin grammar accept the use of double ‘i’ for some patronyms based on Latin names (e.g., if Fabricius is considered a Latin name the patronym would become ‘*fabricii*’, if it is considered a non-Latin name it would be ‘*fabriciusi*’). This rule was often misapplied. Thus, a patronym for Broun should be spelled ‘*brouni*’ and the spelling was altered in many subsequent references. However, current rules of nomenclature declare we must preserve the original spelling for species names (ICZN 1999: Articles 31.1, 32.3, 33.4). Even though Pascoe was grammatically incorrect with his spelling of the name, we must accept his original spelling for the species and call it *C. brounii*.

*Cryptodacne brounii* is very similar to *C. lenis* in most characters, and this sister relationship is supported by cladistic analysis (see below). There were several specimens of *C. lenis* examined that were similar in body size and only a study of male genitalic characters indicated they are different. For now, *C. brounii* and *C. lenis* are considered distinct. It is unfortunate that the precise collection locality of the types of *C. brounii* was not recorded. They remain the only known specimens of this species.

**Additional references.** Broun 1880: 642–643 [reproduction of Pascoe’s description].

### *Cryptodacne ferrugata* Reitter

Fig. 6, 17, 26, Map 2

*Cryptodacne ferrugata* Reitter, 1879: 183.

*Cryptodacne vagepunctata* Broun 1882: 497, **new synonymy**.

**Diagnosis.** *Cryptodacne ferrugata* is readily distinguished from most species of *Cryptodacne* by its entirely red-brown body colour and long dorsal pubescence. It is most similar to *C. pubescens* but can be distinguished by its distribution, golden elytral setae, and male genitalia. *Cryptodacne ferrugata* is the only species where some individuals have a transverse scutellum.

**Description.** Length 3.20–4.40 mm. Width 1.36–1.76 mm. Body (Fig. 6) entirely red-brown. Pronotum and elytra with fine-coarse punctures, broad glabrous longitudinal line on middle of pronotum; each puncture with long seta; elytral setae reaching to or beyond next puncture in series; setae golden in colour. Pronotal length 0.7–0.8× width, widest at middle. Head with subocular line long, 0.50–0.75× length of eye, separated from eye by distance more than one ocular facet. Prosternal process strongly bilobed at apex, sides and coxal lines weakly arched, but basically parallel. Mesoventrite disc enclosed laterally by shallow grooves (= coxal lines), coxal lines connecting anteriorly at midline, most with area between lines raised in the middle. Metaventrite (Fig. 17) with subcoxal line at antero-lateral angle absent or barely reaching outer margin of mesocoxa.

Male with protibia weakly narrowed basally and weakly bent at middle, tibia with small tubercles on inner margin. Female with protibia unmodified, but difficult to distinguish from male.

Male genitalia (Fig. 26): internal sac with ventral lobes sclerotized, each bearing two teeth; microsetae generally distributed, with dense, dark patch of long microsetae ventrally near tip of flagellum obscuring ventral lobes; flagellum much shorter than median lobe, slender, relatively straight but angled at base; flagellar base large, darkened, length just under half entire length of flagellum, oblong, with posteriorly diverging lines; internal sac not extending anterior to flagellar base.

**Variation.** Specimens of *C. ferrugata* differ tremendously in the length and density of the dorsal pubescence. This variation in vestiture appears to be clinal with populations bearing the longest, densest elytral setation found in the southern most parts of its range (SI, SL, DN). Populations to the north have sparser setation. This form of setal variation is also present in *Noteucinetus nummi* Bullians & Leschen (2004) but does not appear to be clinal.

Another notable variation is the shape of the scutellum. While most individuals have the scutellar width 1.2× its length, some individuals have it nearly 2.0× its length, being transverse (*e.g.*, the type of *C. vagepunctata*). No other visible differences correlate with this variation which indicates that more than one species is present.

**Type material examined.** Type material for *C. ferrugata* was not located. Reitter (1879) reported it to be from Greymouth and was collected by Helms. Materials considered to be topotypic were studied and are discussed below.

The holotype of *C. vagepunctata* is labelled: “/ [red ringed disc] Type / [green label] 1445 / Woodh. / New Zealand [underlined in red], Broun Coll., Brit. Mus., 1922–482 / [hand written] Cryptodacne vagepunctata / [red paper] HOLOTYPE *Cryptodacne vagepunctata* Broun, det. P.E.Skelley /” (NHML), female.

**Material examined.** A total of 129 specimens was studied, with 21 males and 14 females dissected for genitalia. Data for material examined is provided in the Appendix.

**Distribution** (Map 2). Widespread in New Zealand.

North Island: ND, AK, CL, BP, TO, WN; South Island: BR, DN, NN, OL, SI, SL, WD.

**Comments.** *Cryptodacne ferrugata* is species number 3156 in Broun’s manual/catalogue. In the description of *C. ferrugata*, Reitter (1879) made no comment on how many specimens were studied, where they were collected or deposited. However, in the introduction of the paper, Reitter clearly states that all species described there were from Richard Helms in Greymouth. This we must assume is the type locality. Reitter’s collection is reported to have been split with part going to the Natural History Museum, London (NHML), and the remainder going to the A. Grouvelle collection presently in the Museum National d’Histoire Naturelle, Paris (Horn *et al.* 1990). There were no indications that any of the specimens in the NHML were Reitter’s. If extant, it is presumed the type is in Paris.

Helms sent specimens to many researchers of his time, and specimens labelled “Greymouth, Helms” were found in many museums. Horn *et al.* (1990) indicate that Helm’s private collection was split with parts going to the Bishop Museum, Honolulu, HI, USA; the Australian Museum, Sydney, Australia; and part to the NHML “via J.C.Stevens.”

Broun (1913:163) stated his specimen of *C. ferrugata* (NHML, subsequently labelled as the type) was collected by Helms at Greymouth and was purchased for him “... at London by Mr. George Lewis ...” This last fact casts doubt on Broun’s female specimen as being Reitter’s type. We should assume, however, that any specimen fitting Reitter’s description for *C. ferrugata*, from Greymouth and collected

by Helms, are topotypic. Thus, Broun’s female specimen is topotypic, but not the holotype as the standard NHML “Type” label would indicate. This specimen has had an additional label placed on it indicating the following: “/ [yellow paper] NOT holotype TOPOTYPE *Cryptodacne ferrugata* Reitter, det. P.E. Skelley/.”

Because the undisputed type of Reitter’s was unavailable for study, the present concept of this species is based on two topotypic specimens, both at the NHML. The first is Broun’s female specimen mentioned above. The second is a male which was mounted on a single card mount with two *C. synthetica*. If there is ever a need to designate a neotype, we would choose this topotypic male. It has been dissected for genitalia and moved to a separate card mount, but placed back on the original pin with the other specimens. It can be recognized by the following label data: “/ [specimen on new card mount edged in red, marked with a male symbol], [underside of card] Topotype *C. ferrugata* R. / [hand written on the original card mount, with 2 specimens of *C. synthetica*] *Cryptodacne synthetica* Greymouth 1886 / Greymouth, New Zealand [underlined with red], Helms / Sharp Coll., 1905–313. / [yellow paper edged in red] TOPOTYPE *Cryptodacne ferrugata* Sharp, det. P.E.Skelley/ 2–*Cryptodacne synthetica* Sharp, det. P.E.Skelley /” (NHML).

*Cryptodacne vagepunctata* is species number 1445 in Broun’s manual/catalogue. Broun (1882) states it is “Described from one example obtained at Woodhill...”, clearly indicating only one specimen was used to describe the species. A holotype label has been placed on the specimen to clearly indicate its status.

*Cryptodacne ferrugata* is most similar to *C. pubescens*. For further discussion, see the comments under *C. pubescens*.

As with other species, meaningful biological data is sparse. *Cryptodacne ferrugata* has been collected on *Pseudopanax*, bracket fungi, *Ganoderma* on Acacia, decayed wood and ferns, rotten wood, litter, bracket fungi at night, dead *Fomes*, at night, in bush remnant, dead tree fern stump, sooty mould, dead branch of beech, lichen on dead *Nothofagus*, flight intercept trap, and dead *Dracophyllum* wood.

**Fungal hosts.** *Ganoderma* sp. (Polyporales), *Fomes* sp. (Polyporales), undetermined bracket fungus, and sooty mould.

**Additional references.** Broun 1886: 813 [reproduction of Broun’s 1882 description of *C. vagepunctata*]; Broun 1910: 78 [partial translation of Reitter’s 1879 description of *C. ferrugata*]; Broun 1913: 163.

***Cryptodacne lenis* Broun**

Fig. 7, 27, Map 3

*Cryptodacne lenis* Broun, 1880: 641.

**Diagnosis.** *Cryptodacne lenis* can be readily recognised by the short dorsal setation, pronotal shape which is widest behind the middle, pronotal punctures usually absent on a central longitudinal strip, and distinct male genitalia.

**Description.** Length 3.52–5.20 mm. Width 1.60–2.24 mm. Body (Fig. 7) dark brown; legs, lateral pronotum, elytral humerus and apex red-brown; many specimens entirely brown. Pronotum and elytra with fine punctures evenly distributed, most with narrow glabrous longitudinal strip on middle of pronotum; each puncture with a short seta, barely visible, barely reaching beyond puncture. Pronotal length  $0.75\times$  width, widest behind middle. Head with subocular line long,  $0.75\times$  length of eye, base separated from eye by distance less than 1 ocular facet. Prosternal process with apex strongly bilobed, sides and coxa lines arched, but basically parallel. Mesoventrite disc enclosed laterally by shallow grooves (= coxal lines), coxal lines connecting anteriorly at midline, area between lines depressed and flat. Metaventrite with submesocoxal line at antero-lateral angle absent behind mesocoxa.

Male with protibia weakly narrowed basally and weakly bent at middle, tibia with small tubercles on inner margin. Female with protibia unmodified, but difficult to distinguish from male.

Male genitalia (Fig. 27): internal sac with small ventral lobes, much smaller than dorsal lobe; microsetae generally distributed, with a band of long setae near middle; flagellum much shorter than median lobe, slender, relatively straight but angled at base; flagellar base large, darkened, length just under  $1/2$  entire length of flagellum, parallel sided, length of sclerotised widened part at base  $2\times$  width; internal sac not extending anterior to flagellar base.

**Variation.** Paler marking on the body may be distinct or not. The elytral pale marks may be connected along the lateral edge or not. These marks are usually smaller than the marks on typical specimens of *C. synthetica*.

**Type Material examined.** The holotype of *C. lenis* is labelled: “/ [red ringed disc] Type / [green label] 1123 / Whangar. / New Zealand [underlined with red], Broun Coll. Brit. Mus., 1922–482 / [hand written] *Cryptodacne lenis* / [red paper] HOLOTYPE *Cryptodacne lenis* Broun, det. P.E.Skelley /” (NHML), female.

**Material examined.** A total of 234 specimens was studied, with 9 males and 12 females dissected for genitalia. Data for all material is provided in the Appendix.

**Distribution** (Map 3). Widespread on the North Island and nearby offshore islands.

North Island: AK, BP, CL, GB, ND, RI, WA, WN.

**Comments.** *Cryptodacne lenis* is species number 1123 in Broun’s manual/catalogue. Broun (1880) stated “I found my specimen near Whangarei Harbour,” clearly indicating he described the species based on a single specimen. It is most readily confused with *C. brounii*. See ‘Comments’ under *C. brounii* for further details.

Specimens have been collected from *Piptopterus portentosus* on *Nothofagus*, pine log in stand of pine trees, *Vitex* mould, rotten *Acacia decurrens*, decayed wood, dead logs in secondary growth, *Grifola collensoi*, *Panellus* sp., pan traps, logs and dead branches, mixed broadleaf forests, on tree at night, *Nothofagus truncata* trunk at night, on fungus at night, dead bole of bat [infested] tree, litter, and bracket fungi in *Nothofagus* forest.

*Cryptodacne lenis* is often confused with *C. synthetica*, but in *C. lenis* the pronotum is converging anteriorly in shape and there are more elytral punctures in a more regular pattern with very short setae. Furthermore, the male genitalia of each is distinctive. These two species were identified together as *C. brounii* by Kuschel (1990).

**Fungus hosts.** *Grifola collensoi* and *Piptopterus portentosus* (Polyporales), *Panellus* sp. (Basidiomycetes), undetermined bracket fungus.

***Cryptodacne nui* n.sp.**

Fig. 8, 24, Map 4

**Diagnosis.** *Cryptodacne nui* is readily distinguished by its large size, lack of dorsal setae, nearly quadrate pronotum, and by the unique form of male genitalia.

**Description.** Holotype male: Length 6.64 mm. Width 2.48 mm. Body (Fig. 8) dark brown, legs red-brown. Pronotum and elytra with fine punctures evenly distributed; each puncture with short seta, barely visible, and barely reaching beyond level of puncture. Pronotum only slightly wider than long, widest at middle. Head with subocular line long,  $0.75\times$  length of eye, base separated from eye by distance less than 1 ocular facet. Prosternal process with apex strongly bilobed, sides and coxal lines arched, but basically parallel. Mesoventrite disc enclosed laterally by shallow grooves (= coxal lines), coxal lines connecting anteriorly at midline, area between lines depressed and flat. Metaventrite with submesocoxal line at antero-lateral angle absent behind mesocoxa.

Male protibia narrowed basally and bent at middle, protibia and profemur with small tubercles on inner margin.

Male genitalia (Fig. 24): internal sac with large ventral lobes, nearly as large as dorsal lobe; microsetae generally distributed in internal sac, but with a dense dark patch dorsally near base of flagellum; flagellum longer than median

lobe, slender; flagellar base with small, cobra-shaped swelling; internal sac lobed anteriorly on either side of flagellar base.

**Variation.** Length 5.52–6.72 mm. Width 2.08–2.56 mm. Female with protibia and profemur unmodified.

**Type material studied.** The holotype of *C. nui* is labelled: “/ NEW ZEALAND BP, Tapapa 300 m, 25 Mar 1978, S. B. Peck, Litter/ S. J. Peck Collection/ [yellow paper] N.Z. Arthropod Collection, NZAC, Private Bag 92170, AUCKLAND New Zealand/ [red paper] HOLOTYPE *Cryptodacne nui* P.E.Skelley /” (NZAC), male.

A total of 13 specimens was studied (holotype and 11 paratypes), with 3 males and 2 females dissected for genitalia. Paratypes are deposited in ANIC, JNIC, NHML, NZAC, and PESC. Data for all specimens are provided in the Appendix.

**Distribution** (Map 4). Widespread in the North Island, but not commonly collected.

North Island: AK, BP, CL, GB, ND, WA, WN.

**Etymology.** The word ‘nui’ is Maori for ‘big’ and is being used here as a noun in apposition.

**Comments.** *Cryptodacne nui* is the largest and most divergent member of *Cryptodacne*. It has been confused with *K. politus* in collections, but is readily distinguished by the generic characters in the key. The only biological information available is that *C. nui* has been collected in bracket fungi, leaf litter, and on *Ganoderma* on a dead standing tree.

**Fungus hosts.** *Ganoderma* (Polyporales), undetermined bracket fungus.

### *Cryptodacne pubescens* Broun

Fig. 9, 15, 29, Map 5

*Cryptodacne pubescens* Broun 1893: 1319.

*Cryptodacne ocularia* Broun 1913: 163, **new synonymy**.

**Diagnosis.** *Cryptodacne pubescens* is readily distinguished from most species of *Cryptodacne* by its red-brown body colour and long dense pubescence. It is most similar to *C. ferrugata* but can be distinguished by its distribution, silver elytral setae, and male genitalia. *Cryptodacne pubescens* is the only species where some individuals have a posteriorly divergent prosternal process.

**Description.** Length 2.88–4.48 mm. Width 1.12–1.76 mm. Body (Fig. 9) entirely red-brown to tan. Pronotum with fine to coarse punctures, broad glabrous longitudinal line on middle of pronotum; each pronotal puncture with long seta; elytral setae reaching to or beyond next puncture in series, usually silver in colour. Pronotal length 0.7–0.8× width, widest at middle. Head with subocular line long,

0.50–0.75× length of eye, separated from eye by distance more than one ocular facet. Prosternal process strongly bilobed at apex, sides and coxal lines nearly straight, nearly parallel or strongly divergent posteriorly. Mesoventrite (Fig. 15) disc enclosed laterally by shallow grooves (= coxal lines), coxal lines weak, connecting anteriorly at midline or not, most with area between lines raised in the middle. Metaventrite with submesocoxal line at anterolateral angle absent or barely reaching outer margin of mesocoxa.

Male with protibia weakly narrowed basally and weakly bent at middle, tibia with small tubercles on inner margin. Female with protibia unmodified, but difficult to distinguish from male.

Male genitalia (Fig. 29): internal sac without ventral lobes; microsetae generally distributed, with dense patch of long microsetae ventrally near tip of flagellum; flagellum much shorter than median lobe, slender, relatively straight but angled at base; flagellar base large, darkened, length just under 1/2 entire length of flagellum, oblong, widest at base; internal sac not extending anterior to flagellar base.

**Variation.** The dorsal pubescence in specimens of *C. pubescens* varies, but always more dense than most specimens of other species. The prosternal process in some specimens of *C. pubescens* is divergent posteriorly. However, others exist that have nearly parallel-sided prosternal processes, making recognition based on this character tenuous. The elytral setae in most specimens is silver, some are more golden. It is not known if these are discoloured due to preservation or are truly different.

**Type material examined.** The holotype for *C. pubescens* is labelled: “/ [red ringed disc] Type / 2320 / [hand written] Moeraki / New Zealand [underlined with red], Broun Coll., Brit. Mus., 1922–482. / [hand written] *Cryptodacne pubescens* / [red paper] HOLOTYPE *Cryptodacne pubescens* Broun, det. P.E.Skelley /” (NHML), male.

A lectotype and paralectotype for *C. ocularia* were studied and are here designated. The lectotype is labelled: “/ 3360 / New Zealand [underlined with red], Broun Coll., Brit. Mus., 1922–482. / [hand written] Wairiri, Kaikoura. / [hand written] *Cryptodacne ocularia* / [red paper] LECTOTYPE *Cryptodacne ocularia* Broun, des. P.E.Skelley /” (NHML), male. The paralectotype is identically labelled, except it is designated as a paralectotype and labelled “.../ [yellow paper] PARALECTOTYPE *Cryptodacne ocularia* Broun, des. P.E.Skelley /” (NHML), female.

**Specimens Studied.** A total of 18 specimens was studied, with 12 males and 6 females dissected for genitalia. Data for material examined is provided in the Appendix.

**Distribution** (Map 5). Restricted to the southern tip of

the North Island and coastal areas of the South Island (North Island: WA, WI, WN; South Island: DN, KA, NN, SD).

**Comments.** *Cryptodacne pubescens* is species number 2320 in Broun's manual/catalogue. Broun (1893) stated it was from "Moeraki, One individual from Mr. Sandager." This clearly indicates he studied only one specimen from Moeraki, whether north of Dunedin or Moeraki Homestead in the Wairarapa, thus it is the holotype and was appropriately labeled for its validation. Broun's type of *C. pubescens* is the only specimen of the species studied from that far south on the South Island. This places some concerns about the accuracy of Broun's label, or our locating his 'Moeraki'.

*Cryptodacne ocularia* is species number 3360 in Broun's manual/catalogue. Broun (1913) stated it was from "Wairiri. Another of Mr. W. L. Wallace's discoveries on the eastern Kaikouras." Broun presents no indication how many specimens were studied, although only one measurement was given. In the Broun collection (NHML) there are two specimens from the type locality that were identically labelled, neither of which have a standard red "Type" disc. Because they appear to be syntypic, the male specimen is here designated as a lectotype to preserve the stability of nomenclature by selecting one specimen as the sole, name-bearing type.

Both *C. pubescens* and *C. ocularia* have eyes that protrude more than the other species. The type of *C. pubescens* has the eye nearly hemispherical, has a nearly parallel prosternal process, a small body size, and was collected from a location some distance from the known specimens of *C. ocularia*. The types of *C. ocularia* have eyes that are slightly flattened anterolaterally, have nearly triangular prosternal processes, and a larger body size. Although the types appear quite distinct, these characters are variable in the few specimens available, and the male genitalia are identical. Thus, *C. ocularia* is here synonymised with *C. pubescens*.

*Cryptodacne pubescens* and *C. ferrugata* are very similar with quite a lot of variability in many characters. While use of male genitalia is the only confident way to identify a specimen, a fair degree of confidence can be reached using a 'majority rule' approach to characters listed here. A specimen would be considered *C. pubescens* if it has a majority of the following: part of a series with a male identified by genitalic dissection; dense elytral setae; elytral setae silver in colour; prosternal base divergent posteriorly; scutellum pentagonal; from the southeast tip of the North Island or the northeastern portion of the South Island (Map 5). A specimen would be considered *C. ferrugata* if it has a majority of the following: part of a series with a male identified by genitalic dissection; elytral setae sparse; elytral setae golden in colour; prosternal base parallel-sided; scutellum more transverse; from the North Island (outside of WN and WA) and the western two-thirds of the South

Island (Map 2).

The only label data available with biological data indicates *C. pubescens* has been collected in decayed wood in bush grasslands, under various logs, in pitfall traps at bush edge, decayed wood in gorse scrub, and in a rotting log.

### *Cryptodacne rangiauria* n.sp.

Fig. 10, 13, 20, 30, Map 6

**Diagnosis.** Unique in possessing a reduced subocular line, nearly truncate prosternal process, and in distribution, the only *Cryptodacne* known from Chatham Islands.

**Description.** Holotype male: Length 3.92 mm. Width 1.52 mm. Body (Fig. 10) dark brown; head, legs, and elytral apex red-brown. Pronotum and elytra with fine to coarse punctures evenly distributed, broad glabrous longitudinal line on middle of pronotum; each puncture with long seta; elytral setae reaching to or beyond next puncture in series. Pronotal length 0.8× width, widest at middle. Head with subocular line reduced (Fig. 13), 0.25× length of eye, separated from eye by distance more than 1 ocular facet; stridulatory files not apparent. Prosternal process truncate at apex (Fig. 20), sides and coxa lines arched, but basically parallel. Mesoventrite disc enclosed laterally by shallow grooves (= coxal lines), coxal lines connecting anteriorly at midline, area between lines flat. Metaventrite with submesocoxal line at anterolateral angle long, reaching middle of mesocoxa.

Male with protibia apparently not narrowed basally or bent at middle, tibia with tubercles not apparent.

Male genitalia (Fig. 30): internal sac without ventral lobes; microsetae generally distributed, with dense patch of long microsetae ventrally near tip of flagellum; flagellum much shorter than median lobe, slender, relatively straight but angled at base; flagellar base large, darkened, length just under 1/2 entire length of flagellum, egg-shaped, narrowed anteriorly; internal sac not extending anterior to flagellar base.

**Variation.** Only one additional male specimen is known. Length 5.00 mm. Width 1.80 mm. This specimen is similar to the holotype except the subocular line greatly reduced, vaguely impressed.

**Type material examined.** The holotype of *C. rangiauria* is labelled: "/ NEW ZEALAND, CH, Pitt I., North Head, 1.xii.1992, R. M. Emberson/ under bark of *Corynocarpus laevigatus* tree/ [green paper] ENTOMOLOGY RESEARCH MUSEUM (LUNZ), Lincoln University, Canterbury, New Zealand/ [red paper] HOLOTYPE *Cryptodacne rangiauria* P.E.Skelley/" (LUNZ), male. The only other specimen known, a male paratype, is labeled: "/ NEW ZEALAND: Chatham Is: Pitt I., Waipaua Scenic Res., 131 m, 44°17.163'S, 176°13.09'W, 17-26-ii-2006, mixed broadleaf-treefern forest, FMHD#2006-068, flight

intercept trap, D.J. Clarke & M. Renner, site DC0022, FIELD MUSEUM NAT. HIST. / PARATYPE *Cryptodacne rangiauria* P.E.Skelley!" The paratype is deposited in NZAC.

**Distribution** (Map 6). Only known from Pitt Island in the Chatham island group (CH).

**Etymology.** Rangiauria is the Maori name for the island where this species was discovered. The name is being applied as a noun in apposition.

**Comments.** The recent discovery of this species on the Chatham Islands (Emberson 1998:41) indicates that more new species may exist elsewhere in remote areas. Only time and more fieldwork will tell. The holotype was collected under bark of *Corynocarpus laevigatus* tree.

### *Cryptodacne synthetica* Sharp

Fig. 2, 11, 14, 16, 18, 21–23, 28, Map 7

*Cryptodacne synthetica* Sharp 1878: 82–83.

*Cryptodacne vittata* Broun 1886: 873, **new synonymy.**

**Diagnosis.** *Cryptodacne synthetica* is readily distinguished by its colour pattern (when present), pronotal shape being widest at or before middle, elytral seta being long but not reaching past the next puncture, and the metaventricle with an anterolateral coxal line behind the mesocoxa extending from the lateral angle to middle of mesocoxa.

**Description.** Length 3.20–4.88 mm. Width 1.36–1.92 mm. Body (Fig. 2, 11) dark brown; legs, lateral pronotum, elytral humerus and apex red-brown; many appear entirely brown, some have a pale stripe connecting humeral and apical spots of elytra on the disc. Pronotum with fine to coarse punctures evenly distributed, with narrow to moderately wide glabrous longitudinal strip on middle of pronotum; each pronotal puncture with long seta; elytral punctures with setae long, but not surpassing next puncture in the series. Pronotal length 0.75 width, widest at or anterior of middle. Head (Fig. 14) with subocular line long, 0.75× length of eye, base separated from eye by distance less than 1 ocular facet. Prosternal process with apex strongly bilobed, sides and coxa lines arched, but basically parallel. Mesoventrite (Fig. 16) disc enclosed laterally by shallow grooves (= coxal lines), lines faint connecting anteriorly at midline or not, area between lines flat. Metaventricle (Fig. 18) with submesocoxal line at anterolateral angle long, reaching middle of mesocoxa.

Male with protibia (Fig. 23) narrowed at basal 1/2 and curved at middle (a difficult character to determine in some specimens); inner margin of protibia with 2 rows of small tubercles; femur lacking corresponding tubercles, but with preapical emargination distinct. Female with protibia (Fig. 22) gradually widening from base to apex; protibia gradually arched along length; protibia and profemur lacking tubercles on inner margin; profemur with preapical emargination weak.

Male genitalia (Fig. 28): internal sac with small ventral lobes, much smaller than dorsal lobe; microsetae generally distributed, with a dense dark patch ventrally near tip of flagellum; flagellum much shorter than median lobe, slender, relatively straight but angled at base, apex always sinuate; flagellar base large, pale, not darkened, length just under 1/2 entire length of flagellum, parallel sided, length of sclerotised widened part at base equal to 2× width; internal sac not extending anterior to flagellar base.

**Variation.** Pronotal setation and punctation is variable enough to be impossible to adequately characterise, especially considering that other species possess similar variability. Elytral setation is variable from individual to individual, but always falls within a range of lengths. It is always prominent enough to project out of their punctures and be visible, but short enough not to surpass the next puncture in the linear series.

Body colouration varies from individual to individual, usually in the size of the red-brown elytral and pronotal marks. These marks often grade gently into the dark brown of the body making them indistinct. Some specimens, possibly teneral, appear to have no marks at all. A regional vittate form distributed in the Wairarapa exists in which the red-brown marks on each elytral disc are connected by a central stripe, as is shown in Fig. 2.

**Type Material examined.** For *C. synthetica*, the holotype, paratype, and two topotypes (see comments below) were studied. The holotype is labelled: "/ [handwritten on card with specimen] *Cryptodacne synthetica*, Type D.S., Tairua, Broun / [red ringed disc] Type / Sharp Coll., 1905–313 / [red paper] HOLOTYPE *Cryptodacne synthetica* Sharp, det. P. E. Skelley !" (NHML), female. The paratype is labelled: "/ [handwritten on card with specimen] *Cryptodacne synthetica*, 2nd. Typ. D.S., Tairua, Broun / Sharp Coll., 1905–313 / [yellow paper] PARATYPE *Cryptodacne synthetica* Sharp, det. P. E. Skelley !" (NHML).

For *C. vittata*, the holotype and a probable paratype were studied. The holotype is labelled: "/ [red-ringed disc] Type / 1554 / Wellingt / New Zealand [underlined in red], Broun Coll., Brit. Mus., 1922–482 / [hand written] *Cryptodacne vittata* / [red paper] HOLOTYPE *Cryptodacne vittata* Broun, det. P.E.Skelley" (NHML), female. The paratype is a male (dissected) that is labelled and mounted exactly as the type, except it lacks the red ringed type label and a determination label. It is here considered to be a paratype and the following label was placed on the specimen: "/ [yellow paper] PARATYPE *Cryptodacne vittata* Broun, des. P.E.Skelley!" (NHML).

**Material examined.** A total of 172 specimens was studied, with 14 males and 12 females dissected for genitalia. Data for material examined is provided in the Appendix.

**Distribution** (Map 7). Widespread on the North Island and mainly in the northern half of the South Island.

North Island: ND, AK, CL, BP, TO, WA, WN; South Island: BR, MB, MC, NN, OL, SD, KA, FD.

**Comments.** *Cryptodacne synthetica* is species number 1122 in Broun's manual/catalogue. Sharp (1878) stated "I have received two specimens from Capt. Broun, as No. 4, and am informed that he found about a dozen individuals of the species in fungus at Tairua." Although he did not designate a type specimen in the original description, Sharp labelled the specimens of *C. synthetica* in a way that clearly indicates which one is his type by original selection. Sharp's specimens at the NHML are mounted separately. On the card mounts under the specimens he wrote "Type" or "2nd. Typ." Additional type labels have been added to help identify these specimens.

Two additional specimens from the type collection of *C. synthetica*, but not seen by Sharp, were in Broun's collection. They have been identified as topotypes and are labelled: "/ [green paper] 1122 / Tairua / New Zealand [underlined with red], Broun Coll., Brit. Mus. 1922-482 / [yellow paper] TOPOTYPE *Cryptodacne synthetica* Sharp, des. P. E. Skelley/" (NHML).

*Cryptodacne vittata* is species number 1554 in Broun's manual/catalogue. Broun (1886) stated this species was from "Wellington: Mr. P. Stewart-Sandanger." However, there is no indication how many were studied, although only one length measurement was presented. There are two specimens, a male and a female, with identical labels and acetate mountings in the Broun collection. The female has Broun's determination label and a red ringed type label; the male has neither. The determination label on the female would indicate that it is Broun's type by his selection. Thus, a lectotype is not needed, and the specimens have been given additional type labels "holotype" and "paratype" to help identify them. Originally each specimen was mounted on a clear acetate card with a green base. They have been remounted on card stock, but the original acetate has been left with the specimens.

The only difference between *C. synthetica* and *C. vittata* is in elytral colour pattern. *Cryptodacne vittata*, recognised by having a central elytral stripe (Fig. 2 and see Hudson 1934: pl. 3, Fig. 4), is restricted to the southernmost part of the North Island: Wellington and Wairarapa. *Cryptodacne synthetica* from the remaining localities lacks the distinct central elytral stripe. However, some specimens from Marlborough and the Marlborough Sounds have vague stripes, being intermediate in pattern. No morphological character could be found to support a hypothesis that more than one species is involved, so they are here synonymised.

*Cryptodacne synthetica*, especially teneral and unicolorous specimens, can easily be confused with *C. lenis*, but differs in having distinct elytral setation, male

protibia curved and male genitalia with the flagellum sinuate at the tip.

The larva has been described by Sen Gupta (1969), but we have not examined the adult specimens from the series and collection details were not published with the description. The larval description was based on "one parasitized dead larva in a fungus with many adults of *C. synthetica* collected by R. A. Crowson in New Zealand."

Label data show this species has been collected in litter and decayed wood, debris, mossy trunk at night, at night on moss in a *Nothofagus* forest, *Knightia excelsa*, in elfin forest leaf litter, hardwood podocarpus forest leaf and log litter, fumagine fungus, under loose bark of *Dacrydium cupressinum*, in decayed wood, on underside of pine log, *Panellus* sp., and pit trap in manuka scrub. Hudson (1934:55, as *C. vittata*) comments that it "... is occasionally found amongst decayed rimu around Wellington." The species was reared from fruiting bodies of *Ischnoderma rosulatum* collected in Fiordland.

**Fungus hosts.** *Panellus* sp. (Agaricales), *Ischnoderma rosulatum* (Polyporales), *Laetiporus portentosus* (Polyporales), and sooty mould.

**Additional references.** Broun 1880: 641 [*C. synthetica* - a reproduction of Sharp's description]; Sen Gupta 1969: 102-103, fig. 2 [larval description]; Sharp & Muir 1912: 523, Pl. LX, Fig. 108, 108a [discussed and illustrated male genitalia].

## CLADISTIC ANALYSIS

Here we reconstruct the phylogenetic relationships of *Cryptodacne* to determine the placements of *C. brounii* and *C. rangiauria*. *Cryptodacne* is monophyletic based on the presence of dilated maxillary palpi, mentum not excavated, and absence of flight wings. All species of *Cryptodacne* were coded and entered into MacClade version 3 (Maddison & Maddison 1992) for character analysis. Tree searches were done in PAUP\* version 4.0 (Swofford 2003). A thorough study of the dacninae genera has not been done, though the tribe was represented by *Combocerus* Bedel, *Dacne* Latrielle, and *Cryptodacne* in the morphological study by Wegryniewicz (2002), coded as a monophyletic group by Leschen (2003, based on representatives of *Cryptodacne*, *Dacne*, *Hoplepiscapha* Lea, and an undescribed Australian genus), and by *Dacne californica* Horn in the molecular study by Robertson et al. (2004). In these studies Dacnini is placed in a basal position in Erotylinae, but the exact sister-relationships of *Cryptodacne* are unclear because a more complete phylogenetic study of the tribe is unavailable. The dilated maxillary palpus present in *Cryptodacne* is present also in

*Cnecosa*, and this genus is a likely sister taxon. We rooted trees with other dacnines as outgroups: *Cnecosa*, *Kuschelengis*, and two species of *Thallis* (*T. janthina* Erichson (Australia) and *T. nigroaenea* Crotch (New Caledonia)). The settings used in PAUP\* for heuristic tree searches include a random addition sequence (100 replicates) with steepest descent; character states were treated as unordered. A total of 19 characters (listed below) were coded and the data matrix is provided in Table 1. Confidence intervals for branches on a cladogram were determined by Bremer support (Bremer, 1988) as implemented in Autodecay 4.0.2'ppc (Eriksson 2000) and Bootstrap analysis (Felsenstein 1985, Sanderson 1995) with 1000 replications to determine support. Characters were optimised onto trees using standard ACCTRAN (accelerated transformation) and DELTRAN (delayed transformation) optimisations (Maddison et al. 1984).

### Characters Used in Cladistic Analysis

1. Dorsal setation of pronotum and elytra. 0, indistinct or absent, if present majority barely extend out of punctures (Fig. 4); 1, distinct, long enough for majority of setae to extend out of punctures (Fig. 9).
2. Colour pattern of dorsal body. 0, absent and with uniform colour pattern (Fig. 1); 1, present, contrasting marks present (Fig. 2).
3. Dorsal punctation. 0, coarse; 1, fine (Fig. 4).
4. Body shape. 0, parallel sided; 1, elongate, sides arched, widest near basal third of elytra (Fig. 1).
5. Terminal maxillary palpomere. 0, acuminate, cylindrical, with terminal sensory area very small and circular (Fig. 19); 1, dilated, with terminal sensory area elongate (Fig. 20). Character state 1 is present only in *Cnecosa* and *Cryptodacne*.
6. Transverse gular groove. 0, incomplete, absent at middle (Fig. 21); 1, complete (Fig. 19).
7. Pronotal shape. 0, sides evenly arcuate (Fig. 1); 1, sides parallel-sided (Fig. 2).
8. Basal bead of pronotum: 0, incomplete, absent at middle (Fig. 5); 1, complete across base, fine (Fig. 4); 2, strong, complete, with punctures in basal groove. In *Thallis janthina* and *Cnecosa insueta* (Crotch) the marginal line is in the form of it a complete deep groove while in *Kuschelengis* it is distant and fine.
9. Prosternal apex. 0, truncate (Fig. 19); 1, emarginate (Fig. 21); 2, lobed or rounded.
10. Male genitalia: dorsal lobe on internal sac. 0, membranous (Fig. 24); 1, partly or entirely sclerotised (Fig. 31); 2, absent. The male genitalic characters require more detailed analysis, especially considering other taxa of Dacninae, and when considering the species presently included in Australian *Thallis*. For example, while the dorsal lobe of *Kuschelengis* is long and basally sclerotised (state 1) the internal sac of *T. janthina* has a sclerite but lacks the lobe and *T. nigroaenea* lacks both structures (*Thallis* is coded with state 2).
11. Male genitalia: fleshy, ventral lobes on internal sac. 0, absent (Fig. 31); 1, present (Fig. 24).
12. Male genitalia: arrangement of microsetae at middle of internal sac. 0, scattered, not discernable patch (Fig. 31); 1, ventral patch of setae (Fig. 30).
13. Male genitalia: flagellar length. 0, short, much shorter than median lobe (Fig. 31); 1, long, as long or longer than median lobe (Fig. 27). The flagellum of *Thallis nigroaenea* is very short and peg-like.
14. Male genitalia: sclerite at base of flagellum. 0, narrowly or not expanded (Fig. 31); 1, broadly rounded (Fig. 30).
15. Male genitalia: sclerite at base of flagellum with an anterior projection, beyond where the internal sac joins with the sclerite. 0, absent (Fig. 31); 1, present (Fig. 24).
16. Female abdominal segment IX surface structure: 0, distinct comb rows, full length of segment; 1, comb rows shortened, half length of segment, or distinct patch of asperites half length of segment; 2, absent or undefined patch of weak asperites.
17. Wing development. 0, present; 1, reduced to membranous strap with terminal binding patch.
18. Tubercles of male profemur. 0, indistinct or absent; 1, small but distinct.
19. Sexual dimorphism of protibia. 0, sexes similar; 1, male protibia arched and tuberculate.

### Results and Discussion

The analysis resulted in three most-parsimonious trees (Tree Length 38, Consistency index = 0.60; Retention index = 0.66) shown in Fig. 34. Tree 3, which is also the same as a strict consensus tree is shown with support values. The conflict among the trees relates to the uncertain basal placements of *C. synthetica* and *C. nui*. The two clades *C. brounii* + *C. lenis* and *C. ferrugata* (*C. pubescens* + *C. rangiauria*) are consistent and supported by the characters mapped onto tree 2 (Fig. 35).

### Sympatry and the Taxonomic Status of *Cryptodacne brounii*

Sympatric populations of *Cryptodacne* can vary extensively in any single character so that it may appear that certain individuals belong to separate species. Without considering the whole organism, series of specimens, male

**Table 1.** Data matrix for cladistic analysis of *Cryptodacne* spp.

	111111111
	1234567890123456789
<i>Kuschelengis</i>	0001011101001001011
<i>mi</i>	0011101010101002111
<i>lenis</i>	0111100010100012100
<i>brounii</i>	001110001010001?100
<i>synthetica</i>	1111101010100012111
<i>rangiauria</i>	101110100001010?100
<i>ferrugata</i>	1011101010110102100
<i>pubescens</i>	1011101010010102100
<i>Cnecosa</i>	1100111220010001011
<i>T. janthina</i>	0000011222001000000
<i>T. nigroaenea</i>	0011011122000001000

**Table 2.** Relative phylogenetic position (RPP) of Chatham Islands taxa.

Taxon	RPP	Reference
<b>Hebe</b> (13 nodes; root with <i>Derwentia</i> spp.)		Wagstaff et al. (2002)
<i>H. barkeri</i> (Cockayne) Cockayne	.85	
<i>H. dieffenbachia</i> (Benth.) Cockayne & Allan	.92	
<i>H. chathamica</i> (Buchanan) Cockayne & Allan	.92	
<b>Pseudopanax</b> (7 nodes; root with <i>Meryta</i> spp.)		Mitchell & Wagstaff (1997)
<i>Pseudopanax chathamicus</i> Kirk	.43	
<b>Anoteropsis</b> (6 nodes; root at <i>Atoria</i> )		Vink & Paterson (2003)
<i>A. insularis</i> Vink	.50	
<i>A. ralphi</i> (Simon)	.83	
<b>Austridotea</b> (10 nodes; root at base)		McGaughran et al. (2005)
<i>A. annectens</i> Nicholls	.30	
<i>A. lacustris</i> (Thomson)	.20	
<b>Celatoblatta</b> (9 nodes; root at <i>Platyzosteria</i> )		Chinn & Gemmell (2004)
<i>C. brunni</i> (Alfken)	.55	
<b>Kikihia</b> (6 nodes; root at <i>Maoricicada</i> )		Arensburger et al. (2004)
<i>K. longula</i> (Hudson)	.83	
<b>Cryptodacne</b> (5 nodes; root at <i>Cnecosa</i> )		this study
<i>C. rangiauria</i> n. sp.	1.00	
<b>Hadramphus</b> (9 nodes; root at outgroup)		Craw (1999)
<i>H. spinipennis</i> Broun	.44	

**Table 3.** Chatham Island taxa that have been studied in a genetic or phylogenetic context. Divergence dates, if known, are provided for each entry. Relative Phylogenetic Position is calculated for some taxa (see text). Trewick (2000) listed a range of 2–6 my for four taxa he studied.

Taxon	Sister-area	character	sampling	Reference
<b>Plantae</b>				
<i>Hebe</i> spp.	widespread	ITS	incomplete	Wagstaff et al. (2002)
<i>Pseudopanax chathamicus</i> Kirk	widespread	morphology, ITS	complete	Mitchell & Wagstaff (1997)
<b>Arachnida</b>				
<i>Anoteropsis ralphi</i> (Simon)	widespread	morphology, COI, ND1	complete	Vink & Paterson (2003)
<5 my				
<i>A. insularis</i> Vink	widespread*			
<5 my				
<b>Amphipoda</b>				
<i>Paracarophium excavatum</i> Thompson	widespread	allozyme	complete	Stevens & Hogg (2004)
4 my				
<b>Isopoda</b>				
<i>Austridotea annectens</i> Nicholls	Otago	COI	complete	McGaughan et al. (2005)
1.9 – 2.2 my				
<i>A. lacustris</i> (Thomson)	Otago	COI	no outgroup	
2.6 – 4.5 my				
<b>Blattodea</b>				
<i>Celatoblatta brunni</i> (Atfken)	Banks Penin.	COI	incomplete**	Chinn & Gemmell (2004)
1.2 my				
<b>Orthoptera</b>				
<i>Talitropsis crassicurris</i> Hudson	North Island	COI	incomplete	Trewick (2000)
<i>T. megatibia</i> Trewick				
<b>Hemiptera</b>				
<i>Kikihia longula</i> (Hudson)	Nelson	COII, ATPase6, ATPase8	complete	Arensburger et al. (2004)
1.5 my				
<b>Coleoptera</b>				
<i>Mecodema alternans</i> Lap. de Cast.	South Island	COI	incomplete	Trewick (2000)
<i>Saprosites sulcatissimus</i> (Broun)	—	morphology	incomplete	Stebnicka (2005)
<i>Cryptodacne rangiauriana</i> n. sp.	Widespread	morphology	complete	this study
<i>Hadramphus spinipennis</i> Broun	Fiord./Snare	morphology	complete	Craw (1999)

\* Relationships listed in the table are based on the combined tree, but the COI tree shows a Southland sister area.

\*\* Study focused on the South Island members of the group.

genitalia, and location of capture, it is often difficult to recognise a species without careful study. Unfortunately biological data, such as host fungus that may also provide important clues to species limits, is generally unavailable. *Cryptodacne brounii* differs from *C. lenis* in colour variation and by having a shorter base of the flagellum and these two species group consistently in the reconstructed trees. This suggests that *C. brounii* may be a variant of *C. lenis*, which it closely resembles, but we have not found aedeagi in populations of *C. lenis* that resemble *C. brounii*. However, because specific locality information for *C. brounii* is not available it is not possible to assess whether or not the characters in *C. brounii* are aberrant.

It is not clear if the relative similarity of the widespread *Cryptodacne* populations is an indication of speciation in a recent time frame. It is possible that species could have been isolated by geologic features, such as the deposition of ash and tephra mainly in the North Island or mountain building in the South Island, and diverged into separate species due to an interruption of gene flow, and later formed sympatric distributions through faunal mixing. It is also possible that current sympatric distributions are the result of allopatric speciation during a time when New Zealand was reduced to a series of smaller islands during the Oligocene (Fleming 1979, Cooper & Millener 1993, Cooper & Cooper 1995). *Cryptodacne* have the hind wing reduced to a narrow strap, and are presumed to be ancestrally flightless, and brachyptery may have been a factor that facilitated the speciation in the mainland forms. Being flightless and with potentially isolated populations over a broad range, any of the *Cryptodacne* species could contain cryptic species that could be recognised by further morphological or molecular study which will have to be considered in a more detailed analysis when more material and data are available.

#### Phylogenetic Placement of *C. rangiauria* and other Chatham Island Species

Examined in the context of the reconstructed phylogenies, *C. rangiauria* is sister taxon to *C. pubescens* and is nested in a clade of taxa that are widely distributed in the North and South Islands. Because *C. rangiauria* is not located at a basal position and is rather derived for the genus, this phylogenetic location supports other phylogenetic studies where it has been shown that the Chatham Islands fauna has recently dispersed from the mainland (e.g., Knox 1960, Trewick 2000, Arensburger et al. 2004, Stevens & Hogg 2004).

In the absence of molecular data, we can provide quantitative evidence for relative age (or placement in a cladogram) by examining phylogenetic position in a cladogram as calculated by measuring *Relative Phylogenetic*

*Position* (RPP) which is the ratio of the node number of the taxon/longest path in the cladogram beginning at the root of the tree (Leschen 2005). An RPP < 0.50 is considered relatively basal, while an RPP > 0.50 is relatively derived. The RPP for *C. rangiauria* is 1.0 (5/5) indicating that this species (and *C. pubescens*) is one of the most derived members of the group. There are problems with this simple method (Leschen 2005) and biases include taxonomic level, numbers of terminals, multiple trees, and resolution of polytomies. Here polytomies were not reconstructed and trees derived from combined data were examined if multiple trees were provided in the original paper.

Calculating the RPP for Chatham Islands taxa in groups with rooted phylogenies from recent literature indicates that most species are relatively derived (Table 2). Interestingly, the population level studies had low RPP values (e.g., *Austridotea*). The high RPP value for most Chatham Islands endemics indicates that these had ancestors that were recent colonisers to the islands perhaps dating at the earliest from the Pliocene through to more recent times based on molecular clock data (Trewick 2000, Vink & Paterson 2003, Arensburger et al. 2004, Chinn & Gemmill 2004, Stevens & Hogg 2004, McGaughan et al. 2005), rather than an ancient connection dating to 70 my (Campbell et al. 1993), when the South Island was connected to the Chatham Islands as indicated by old Mesozoic continental crust making up the Chatham Rise.

#### Source Areas of the Chatham Islands Biota

Emberson (1995, 1998) surveyed the Chatham Islands beetle fauna and indicated 30% of the species are endemic to the Chatham Islands and there is a strong South Island connection. In previous papers, Craw (1988, 1989) hypothesised that the Chatham Islands fauna was a composite of northern and southern elements. Phylogenetic reconstructions showed that closest relatives were widespread taxa (Table 3), as supported by our data for *Cryptodacne*, and we can assume that widespread taxa are better dispersers, or have a higher chance of colonising offshore islands and splitting into daughter species.

We can determine the location of the source area by examining known phylogenies for Chatham Islands taxa. A null hypothesis of a widespread ancestor would be falsified if sister taxa are exclusively found in the South or North Island, or by having a restricted range on the mainland. If immediate sister-taxa are restricted in distribution then the higher level clade to which the sister taxa belong may consist of widely distributed species, providing evidence of an ancient ancestrally widespread species that gave rise to disjunct species on the Chatham Islands and elsewhere. We review recently published phylogenies based on traditional and/or molecular approaches (Table 3) to test

the widespread ancestral species hypothesis. Note that if there are multiple endemic Chatham Island species in a single phylogeny then the reconstructed sister-relationships are treated as independent colonisation events.

## Plants

*Hebe* (Scrophulariaceae) is a large group of plants in New Zealand, with over 100 species and varieties, with three endemic species on the Chatham Islands, and has been studied by Wagstaff *et al.* (2002, see also Wagstaff & Garnock-Jones 1998). In a strict consensus tree consisting of exemplar *Hebe* species Wagstaff *et al.* (2002) place the three Chatham Island species in a large polytomy consisting of New Zealand and non-New Zealand taxa. Two species are sister taxa (*H. dieffenbachia* (Benth.) Cockayne & Allan, and *H. chathamica* (Buchanan) Cockayne & Allan) while *H. barkeri* (Cockayne) Cockayne remains isolated with uncertain sister relationships. Based on this study it is not certain if there were one or two colonisation events to the Chatham Islands. An analysis of the 17 described species of *Pseudopanax* (Araliaceae) was presented by Mitchell & Wagstaff (1997) and in this work *Pseudopanax chathamicus* Kirk is placed in a trichotomy with the widespread taxa *Pseudopanax crassifolius* (Sol. ex A.Cunn.) K. Koch and *Pseudopanax ferox* Kirk, a relationship strongly supported by morphological characters in a combined analysis (Mitchell and Wagstaff 1997).

## Spiders

Vink & Paterson (2003) reconstructed the relationships of all lycosid spider species contained in the genus *Anoteropsis* L. Koch, two species of which are endemic to the Chatham Islands. In the combined analysis of two genes and morphology (based on the earlier work by Vink 2002), there were two separate colonisations of the Chatham Islands from widespread taxa (one sister comparison was assessed by examining the relationship of the Chatham Island species to two different clades, all three were part of basal trichotomy, see Vink & Paterson (2003, Fig. 6). In the morphological tree (Vink 2002) the two relationships of the Chatham Islands species are as follows: *A. okatainea* Vink, North Island (*A. senica* (L. Koch), widespread (*A. insularis* Vink, Chatham Islands (*A. ralphi* (Simon), Chatham Islands (*A. hilaris* (L. Koch), widespread))))). If true, then this relationship suggests that the Chatham Islands was a sister area to the derived widespread distribution present in *A. hilaris*. We prefer the combined tree because it explains all of the data and supports a more parsimonious hypothesis based on a mainland origin of the species with two colonisation events (the ancestor of *A. ralphi* and *A. hilaris* is more derived). The relationships among the ND1 partition show that *A. insularis* is sister

taxon to 14 taxa which also contains the derived sister pair *A. ralphi* + *A. hilaris*. In summary, the *Anoteropsis* data show widespread sister taxa to the Chatham Islands species, but in one partition, one species is sister taxon to a Southland species.

## Isopods

The relationships of the endemic freshwater isopod genus *Austridotea* (containing 3 spp., Idoteidae) were reconstructed by McGaughan *et al.* (2005). There were two colonisation events from regions in the South Island to the Chatham Islands: One colonisation event was by *A. annectens* Nicholls, with basal populations located on Pitt Island, Chatham Islands, (the species is sister taxon to *A. benhami* Nicholls found in Otago). Within the species *A. lacustris* (Thomson), the basal-most population is found in Fiordland and this is sister to populations present on Pitt Island with populations present also in Otago, and on Stewart and Campbell Islands). Though not a phylogenetic study, Stevens & Hogg (2004) demonstrate that the Chatham Islands populations of the amphipod *Paracorophium excavatum* Thomson (Corophiidae) share alleles with southern North Island and widespread South Island populations.

## Insects

Arensburger *et al.* (2004) reconstructed the phylogeny of *Kikihia* Dugdale cicadas (10 of 11 described species, Cicadidae) and showed that the Chatham Island species *K. longula* (Hudson) is sister taxon to an undescribed species from Nelson, and these two are sister taxa to a species from Kaikoura (*K. paxillulae* Fleming). This relationship was supported in the two trees they presented.

*Saprosites* Redtenbacher (Scarabaeidae, Aphodiinae) is a relatively diverse scarab beetle genus distributed in Australia, Central and South America, and New Zealand (Stebnicka 2005). In her cladistic study, Stebnicka (2005) included all eight of the mainland New Zealand species, the Chatham Islands *S. sulcatissimus* (Broun), three South American species, and one Australian species introduced to New Zealand. Determining the relationships of the Chatham Island species to other taxa is ambiguous because there is a basal polytomy of seven taxa (New Zealand and South America) with a monophyletic group composed of *S. sulcatissimus*, the Australian species, and the remaining New Zealand species.

Craw (1999) reconstructed the phylogeny of Molytini weevils. The genus *Hadramphus* Broun composed of 4 species has one species found on Chatham Islands (*H. spinipennis* Broun), and it is sister taxon to a species found in Fiordland and the Snares (*H. stilbocarpace* Kuschel).

Trewick (2000) provided partial phylogenies for four

insect groups in his study. Trewick (2000) sampled eight of the 13 species of cockroaches in the genus *Celatoblatta* Johns. The Chatham Islands species *C. brunni* (Alfken) is shown as sister taxon to a South Island species *C. quinque maculata* Johns. A more detailed study of the South Island taxa by Chinn & Gemmell (2004) showed that the *C. brunni* was sister taxon to *C. penninsularis* Johns, a species endemic to Banks Peninsula. The Chathams + South Island pattern holds (Trewick 2000), though the ancestral area can be reconstructed more precisely in the more complete study by Chinn & Gemmell (2004). Three of the five species of the cave weta genus *Talitropsis* Bolivar (Rhaphidophoridae) were included in the Trewick (2000) study. In the unrooted network, the two Chatham Islands species *T. megatibia* Trewick and *T. crassicuris* Hudson are monophyletic and are derived from a polytomy consisting of the North Island populations of *T. sedilloti* Bolivar.

The carabid beetle *Mecodema alternans* Laporte de Castelnau is present on the Chatham Islands, the southern portion of the South Island, and the Snares and this species is shown as a sister taxon to the widespread South Island species *M. rugiceps* Townsend in Trewick (2000). There are over 50 species of *Mecodema* Blanchard (Larochelle & Lariviere 2001), and seven species were included in Trewick (2000) with one from the North Island. Lastly, three species (one of which is undescribed) of the lucanid *Geodorcus* Holloway from The Sisters, Chatham Islands, and the South Island were sampled by Trewick (2000); but, note there are 10 described and undescribed species from North and South Islands (Holloway 1961, 1996), and this group is not considered for this study.

## Discussion

Of the 13 taxa surveyed with unambiguous area-reconstructions, Chatham Island has six closely-related taxa that are widespread (*Hebe*, *Pseudopanax*, *Anoteropsis* spp., *Paracorophium*, *Cryptodacne*), six closely-related taxa that are from the South Island (*Austridotea* spp., *Celatoblatta*, *Kikihia*, *Mecodema*, *Hadramphus*), and one closely-related taxon from the North Island (*Talitropsis*). Four distributions of the South Island sister-areas are relatively restricted and one was uninformative (*Saprosites*). While half of the sister-comparisons show a South Island source for the Chathams Islands fauna as suggested by Emberson (1998), about half show widespread distributions supporting older hypotheses listed by Craw (1988), resulting in no real consensus for accepting the widespread ancestral area hypothesis.

Part of the problem with the test we provide is that some of the studies do not have rigorous sampling of species or populations. Most molecular studies suffer from

incomplete taxon sampling, either by having limited samples of populations of the ingroup, or by having no outgroups to identify the roots of the trees. Incomplete sampling is a further problem because exact sister-species or population cannot be determined (compare the two studies of *Celatoblatta*). This is also exemplified in Stebnicka's (2005) phylogeny where the single Australian species is grouped with the Chatham Island species of *Saprosites*, and one is left to wonder if there were multiple origins of the New Zealand fauna, highlighting the importance of sampling outside of the group of interest and including more outgroups to better root the tree.

The morphological studies of *Hadramphus* and *Cryptodacne* included all of the available taxa that allows for complete assessment of relationships. However, ancestral population-areas cannot be located in widespread sister-species, which can only be determined in molecular studies that have adequate population sampling. A molecular analysis of *Cryptodacne* would be useful to determine if populations of *C. rangiauria* are more closely related to South Island populations of *C. pubescens* than to North Island populations. This is similar to the situation in corophiid amphipods where North and South Island populations of *Paracorophium excavatum* shared alleles with those in Chatham Islands (Stevens & Hogg 2004), but in this case, characters useful for cladistic analysis are needed to reconstruct the phylogeny of the group.

## Biogeographic Summary

Analytical and data-set issues aside, the biogeographic information indicate that there may be several factors that facilitated the arrival of colonising species to the Chatham Islands. Different source areas, separate arrivals in the spider data (Vink & Paterson 2003), and variance among molecular dates (compare Trewick 2000, Vink & Paterson 2003, Arensburg *et al.* 2004, Chinn & Gemmell 2004, Stevens & Hogg 2004, and McGaughan *et al.* 2005) indicate independent times of colonisation events. The range of molecular dates for nodes containing Chatham Islands endemic species or populations are from Pliocene and post-Pliocene indicating that mainland dispersers arrived during or after the formation of the Manawatu Strait (or Pliocene Sea Strait) present during the lower Pliocene during a time of submergence (Fleming 1979, Cooper & Millener 1993, Lewis & Carter 1994). When the Manawatu Strait was present, ocean currents driven by westerly forcing may have facilitated movement of the first colonisers to the Chatham Islands, like the separate ancestors that gave rise to *Anoteropsis insularis*, *Paracorophium excavatum*, and *Austridotea lacustris*. More recent colonisers may have used intervening islands as stepping-stones, island hopping to the Chatham Islands (Fleming 1979) during peri-

ods of more recent glaciation. Because dispersal is an ongoing process that occurs over great distances (e.g., Hoare 2001), dates provided by molecular studies need to be examined prudently.

More complete phylogenetic studies for all Chatham Islands species and their relatives are needed for a biogeographic synthesis, but here we offer a scenario for *Cryptodacne*. The trans-Cook Strait coastal distribution of *C. pubescens* presently occupies areas that were submerged during the Pliocene, including, significantly, what was submerged during the presence of the Manawatu Strait. It is tempting to suggest that there may have been a widespread ancestor that gave rise to the widely distributed *C. ferrugata* and the ancestor of *C. pubescens* + *C. rangiauria* prior to the development of the Manawatu Strait. Ancestral populations of the species *C. pubescens* + *C. rangiauria* colonised newly emerged lands and dispersed to the Chatham Islands forming *C. rangiauria* after the Pliocene. Such a “near coastal” or “Manawatu Strait” ancestor of Chatham Islands fauna could be present in other lineages.

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**Appendix 1.** Information for specimens examined. All NZAC except where noted.

*Kuschelengis politus*

**North Island. AK.** 1, Huia, 6 Sep 1966, B. M. May, in tunnels *Leptospermum scoparium* (NZAC04010527); 3, Auckland, Laingholm, 15 Jun 1980, R. H. Kleinpaste (NZAC04010639); 13 Jul 1980 (NZAC04016744, -16218); 2, Henderson, Henderson V, NZMS 260 R11-548783, 2 Nov 2001, S. E. Thorpe, tree trunks at night in bush remnant along banks of Opanuku stream [1-PESC] (LUNZ); 5, Henderson, 3 Dec 1998, S. E. Thorpe, under bark on dead standing tree (NZAC04016345, -16552, -16746, -16854, -16873); 1, Clevedon, 1125, Broun Coll. Brit. Mus. 1922-482 (NHML); 1, Swanson, 21 Nov 1917 (NHML); 1, Tawharanui Pen. Buckletons Bay, 3 Apr 1991, G. Allen, ex *Cordyline australis* (NZAC04010486); 1, Bethells, Te Henga Swanp, 5 Nov 1983, J. C. Watt, ex dead standing *Corynocarpus laevigatus* (NZAC04010625); 2, Bethells, Matuku Reserve, 29 Jan 1998, R. Leschen, C. Carlton, ex *Auricularia polytricha* RL155 (NZAC04016576, -16864); 5, 10 Jan 1985, G. Kuschel, sifted rotten wood 85/4 (NZAC04016516, -16822, -16897, -16905, -16971); 1, 10 Jan-18 Feb 1985, R. C. Craw, reared W85/2 (NZAC04016444). **BP.** 1, Te Koau, 120 m, 10 Mar-29 Apr 1993, J. S. Dugdale, pit traps (NZAC04016209); 7, Waenga, NZMS 260 Y14-652913, 27 Jan 1993, R. M. Emberson, on rotten log at night [2-PESC] (LUNZ). **CL.** 1, Barrier, A. E. Brookes coll. (NZAC04010597); 1, Little Barrier I, Te Titoki Flat, 25 Aug-4 Sep 1958, J. C. Watt, ex fallen nikau sheath (NZAC04010518); 1, Gt Barrier Island, 10 Apr 1917, 1125., T. Broun coll. (PESC); 2, Tairua, 187, xxiv, Pascoe Coll., 93-60 (NHML). **ND.** 2, Kaiwaka, 28 Nov 1995, on bole of dead cabbage tree, 0712 (JNIC); 2, Mangamuka Mt, 9-10 Jan 1927, C. E. Clarke, C. E. Clarke Coll., B.M.1957-24. (NHML); 2, Mt Tiger, Whangarei, 27 Nov 1937, E. Fairburn, 1125., A. E. Brookes coll. (NZAC04010510, -10507). **RI.** 1, Erua, 1 Feb 1917, 1125, T. Broun coll., A. E. Brookes coll. (NZAC04010636). **WN** 1, Korokoro, 1 Apr 1921, G. V. Hudson, 1017, Pres.by Imp. Bur. Ent. Brit. Mus.1924-364 (NHML); 1, Kaitoke, 25 Dec 1908 (MONZ); 1, 9 Nov 1909 (MONZ); 2, Port Nicholson, [lectotype and paralectotype, *Engis politus* White] (CUMZ); 1, T[itahi] Bay, 17 Sep 1910, H.W. S[immonds] (MONZ). **South Island. NN** 1, Teal Valley, Nelson, 11 Sep 1960, J. I. Townsend, R. M. Bull coll. (NZAC04010496). **SD.** 1, Queen Charlotte Sd, Endeavour Inlet, 5 Jan 1983, J. W. M. Marris, under bark of rotten log, mixed broadleaf /podocarp forest (LUNZ). **Unknown locality.** 1, [1-PESC] (FREY); 2, 1125, New Zealand 93-56 (NHML); 1, 1125, Broun Coll. Brit. Mus. 1922-482 (NHML); 1, Pascoe Coll., 93-60 (NHML); 1, Broun, Sharp Coll., 1905-313 (NHML); 1, ex coll. J. E. Lewis, G. C. Champion Coll., B.M.1927-409 (NHML); 3, 1125 (NMNH); 2, Broun, 51664, Fry Coll., 1905-100 (NHML); 1, E. S. Gourlay Acc. 1970 Ent. Div. (NZAC04010479); 8, 1125, T.Broun coll., A.E.Brookes coll. [2-PESC] (NZAC04010480, -10490, -10509, -10535, -10570, -10579, -10590, -10622).

*Cryptodacne nui*

**North Island. AK.** 1, Wenderholm Scenic Reserve, 0-30 m, 1 Jan 1984, P. M. Hammond, in bracket (NHML). **BP.** 1, Tapapa, 300 m, 25 Mar 1978, S. B. Peck, leaf litter (NZAC04010616). **CL.** 2, Great Barrier I, Mt Hobson, 600 m, 18 Feb 2002, J. W. Early, S. E. Thorpe, on bracket fungus at night L21090 (AMNZ). **GB.** 1, Lake Waikareiti Tk, 38°44'S, 177°10'E, 2 Oct 2002, R. Leschen, Berlese, RL710 (NZAC04010626). **ND.** 2, E. Pandora Rd., Te Pahi Coastal Park, 7 Feb 1975, A. K. Walker, 75/140, *Ganoderma* on dead standing tree [1-PESC] (NZAC04010561, -10514); 1, Mangamuka, 30 Mar-5 May 1999, R. Leschen, FIT A RL407 (NZAC04010489); 1, Whangarei, 28 Dec 1926, A. E. Brookes (NZAC04010562). 2, Kara, Whangarei, 24 Dec 1926, A. E. Brookes, [1-PESC] (NZAC04010495, -10466). **WA.** 1, Pukeroi Rng, 11 Apr 1976, 1092, 2274 [under card mount] (JNIC). **WN.** 1, 10 km.S.Levin, Tararua SF, Waiwaka Stream, 180 m, 8 Mar 1978, S. & J. Peck, bracket fungi (ANIC).

*Cryptodacne lenis*

**North Island. AK** 2, Auckland, 1 May 1952, R. P. Lamb (NZAC04010627, -10462); 1, 1 Mar 1933, C.E. Clarke Collection (AMNZ); 1, Auckland, Titirangi, 9 Feb 2003, S. E. Thorpe, on dead tree (AMNZ); 8, Auckland, Western Springs, NZMS 260 R11-642805, 13 Oct 2001, S. E. Thorpe, ex pine log in stand of pine trees (AMNZ, LUNZ); 1, Auckland City, The Domain, 27 Oct 2003, S. E. Thorpe, ex wood pile (AMNZ); 1, Atuanui, Mt Auckland, 1 Apr 2002, A. Warren, pit trap C25 (AMNZ); 2, Helensville, Broun Coll. (NHML, HNHM); 10, Lynfield, Tropicana Dr, 21 Aug 1976, G. Kuschel, decayed wood (NZAC04010593, -10595, -16441, -16543, -16720, -16755, -16791, -16960, -17035, -17076); 1, Lynfield, 5 Sep 1976, G. Kuschel, decayed wood (NZAC04010573); 1, 25 Jun 1977, G. Kuschel, rotten wood (NZAC04016410); 1, 24 Dec 1978, G. Kuschel (NZAC04010460); 9, 4 May 1979, G. Kuschel, rotten *Acacia decurrens* (NZAC04010575, -10585, -10588, -10592, -16357, -16398, -16651, -16929, -16941); 1, 7 Mar 1981, G. Kuschel, in dead *Vitex* (NZAC04016592); 3, 20 June 1981, G. Kuschel, *Vitex* mould (NZAC04010498, -16560, -16274); 3, Logues SR, 13 Jul-10 Aug 1999, G. Hall, pit traps (NZAC04016513, -17068, -17108); 6, Mangatangi, Hunua Range, 5 Apr-May 1977, I. Barton, ARA Kauri Seed Project pit trap 4 (NZAC04010505, PESC, NZAC04010483, -10502, -10550, -10619); 3, 28 Oct 2001, S. E. Thorpe, ex fungus on rotten log (AMNZ); 1, McElroy SR, 22-29 Dec 1998, G. Hall, pit traps (NZAC04016403); 1, Wattle Bay, 26 May 1996, J. Klimaszewski (NZAC04010587). **BP.** 1, Kaiangaroa, 10 Mar 1918, A. E. Brookes coll. (NZAC04010548). 1, Hicks Bay, 14 Mar-Apr 1993, J. S. Dugdale, pit traps (NZAC04016652); 1, Karakatuwhero R., 2 Feb 1993, J. I. Townsend, in rotten log (NZAC04010464); 1, Okauia, 11 Mar 1922, 1122, A.E. Brookes coll. (NZAC04017039); 1, L. Rotoiti, 13 Nov 1999, R. Leschen, ex *Panellus*, RL 457 (NZAC04016359). 7, Lake Rotoiti, Otaramarae, 29 Dec 1977, J. S. Dugdale, ex dead logs in secondary growth brush (NZAC04010478; -10539, -10541, -10542, -10546, -

- 10598, -10613); 1, Lake Rotoiti, Rotoehu Rd.N. of Matawhaura Bluff, 29 Dec 1977, J. S. Dugdale, ex logs and dead branches in forest (NZAC04010468); 17, L. Rotoiti SR, Rotoma, 1 Jan 1979, J. S. Dugdale, ex *Grifola colensoi*, duplicate specimens in alcohol (NZAC04010474, -10526, -10549, -10569, -10580, -10612, -10614, -10635, -16224, -16385, -16419, -16608, -16664, -16676, -16863, -16894, -16924); 1, Te Koau, Twin Puriris, NZMS 260 Z14-779865, 15 Mar-19 Mar 1993, R. M. Gilbert, yellow pan trap in mixed broadleaf forest, East Cape Insect Survey 1992/3 (LUNZ); 1, Twin Puriris track, 14 Mar 1993, J. W. M. Marris, on tree at night (LUNZ); 6, Twin Puriris, 23 Sep-Oct 1992, J. S. Dugdale, pit traps (NZAC04016212, -16509, -16526, -16740, -16796, -16825); 2, 24 Oct-1 Dec 1992, G. Hall, pit traps, duplicate specimens in alcohol (NZAC04017040, -16426); 6, 1 Dec 1992-31 Jan 1993, R. C. Henderson, pit traps (NZAC04016406, -16439, -16804, -16930, -16953, -17022); 8, 31 Jan-15 Mar 1993, R. C. Henderson, pit traps (NZAC04016432, -16589, -16663, -16816, -16862, -16868, -17014, -17026); 13, 15 Mar-29 Apr 1993, J. S. Dugdale, pit traps (NZAC04016341, -16405, -16465, -16488, -16565, -16570, -16650, -16703, -16734, -16767, -17007, -17015, -17032); 1, Te Rereauria, NZMS 260 Y14-584906, 24 Jan 1993, R. M. Emberson, on *Nothofagus truncata* trunk at night (LUNZ); 1, 24 Nov 1992-26 Jan 1993, J. S. Dugdale, pit traps (NZAC04016568); 1, Lottin Pt. Rd, Waenga Bush, 20 Oct 1992, J. S. Dugdale, pit trap (NZAC04010606); 1, Waenga, NZMS 260 Y14-652913, 11 Mar 1993, J. W. M. Marris, on fungus at night (LUNZ); 4, Waiaroho, 26 Nov 1992-26 Jan 1993, J. S. Dugdale, pit traps (NZAC04016387, -16418, -16635, -16952); 1, 10 Mar-28 Apr 1993, G. Hall, pit traps (NZAC04016797); 2, 10 Mar 1993, J. S. Dugdale, litter 93/35 (NZAC04016710, -16827); 6, Waiaroho Stm, 80 m, 26 Jan 1993, J. W. Early, on ?*Fomes* on dead tree trunk at night (AMNZ); 2, on soft fungus on fallen rotten log (AMNZ); 3, Waiaroho, 80 m, 10 Mar 1993, R. F. Gilbert, beneath Tawa bark (AMNZ); **CL**. 4, Kaiarau, 11 Mar 1922, A. E. Brookes Collection (NZAC04016683); 10, Little Barrier I., Summit Trk, 243 m, 10 Mar 1974, J. C. Watt, ex *Piptopterus portentosus* on *Nothofagus*, dups. in alcohol [1-PESC] (NZAC04010475, -10497, -10516, -10531, -10572, -10582, -10591, -10596, -10623, -10630). 1, Coromandel, 29 Jan 1947, J. M. Dingley (NZAC04017088); 1, 29 Jan 1947, J. M. Dingley (NZAC04016934); 2, 1 Jan 1947, J. M. Dingley (NZAC04016717, -16400); 1, Mayor I, 11 Nov 1955, 295A, J. C. Watt coll. Ent. Div. DSIR 1966 (NZAC04017102); 1, Great Barrier Is, Little Windy Hill, 800 m, 31 Mar-Apr 2003, K. Parsons, pit trap area #3 (AMNZ); 1, Great Barrier Is, Te Paparahi, 1 Feb 2002, A. Warren, pit trap G11 (AMNZ); 1, pit trap H23 (AMNZ). **GB**. 1, East Cape, Kakanui, 27 Oct-2 Dec 1992, G. Hall, pit traps (NZAC04016805); 1, Kakanui, NZMS 260 Z14-876806, 300 m, 1 Feb-16 Mar 1993, R. M. Emberson, pitfall trap, *Nothofagus truncata* forest (LUNZ); 1, Kakanui, 300 m, 2 Dec 1992-1 Feb 1993, R. C. Henderson, pit traps (NZAC04017027); 1, Taikawakawa, 18 Mar-1 May 1993, G. Hall, pit traps (NZAC04016492); 1, 300 m, 2 Feb 1993, J. W. Early, in rotten log (AMNZ); 1, Waimata Valley, Kaharoa Stn, 22 Nov 1993-10 Jan 1994, G. Hall, pit traps (NZAC04016602); **ND**. 1, Maungaturoto Gorge., 18 Jan 1924, C. E. Clark, C. E. Clarke Collection, B.M.1957-224 (NHML); 2, Omahutu SF, Kauri Sanctuary, 8 May 1974, G. Kuschel, in dead bole of bat tree (NZAC04010567, NZAC04010563); 1, Parua, 1123, Broun Coll. (NHML); 1, Pekaerau, 26 March 1918, 1123, Broun Coll. (NHML); 1, Ngaiotonga Saddle, 3 Nov 1981, G. Kuschel, litter and decayed wood 81/120 (NZAC04017091); 1, Spirits Bay, Maipuna Stream, 9 Nov 1967, J. I. Townsend & J. McBurney, litter (NZAC04010565); 2, Te Paki Trig, 23 Nov 1982, G. Kuschel, litter & decayed wood 82/119 (NZAC04017019, -17105); 1, Waikaraka Res., Whangarei, 16 Jan 1927, A. Richardson, C. E. Clarke Coll. (NHML); 4, Waipoua SF, Waikahatu Br., 200 m, 11-14 April 1980, A. Newton, M. Thayer, *Agathis*-podocarpus broadleaf (ANIC); 2, Waipoua SF, Toronui Track, 30 Oct 1980, G. Kuschel, sifted decayed wood 80/96 (NZAC04010577, -16261); 11, Waipoua SF, Yakas Tk, 29 Mar-5 May 1999, R. Leschen, FIT B RL 410 (NZAC04016343, -16368, -16412, -16460, -16616, -16786, -17044, -17082, -17100); FIT RL 418 (NZAC04016641, -17053); 1, Whangarei, nr Kaeo, 11 Dec 1963, P. M. Johns, tree fern (NZAC04016216); 1, Whangarei, Mt Tiger, 4 Dec 1926, A. E. Brookes coll. (NZAC04010555); 1, Whangarei Harbour, 1123, [holotype *C. lenis*] (NHML). **RI**. 1, Ohakune Main Trunk Line, 7 Apr 1905, T. R. Harris, 1554, A. E. Brookes coll. (NZAC04017067); **TO**. 1, Waimarino, 9 Feb 1938, C. E. Clarke Collection (AMNZ). **WA**. 6, Hastwell, 10 Jul 1936, Fairburn, A. E. Brookes coll. [6-PESC] (NZAC04016275, -16659, -16686, -16749, -16803, -16849). **WI**. 1, Bruce Park, SH1, 260 m, 3-6 Feb 2000, J. W. Early, yellow pan trap rimu/tawa forest (AMNZ). **WN**. 3, Akatarawa, Kakanui Pk, 850 m, 9 Mar 1978, S. & J. Peck, bracket fungi (NZAC04016980, -16606, ANIC); 2, Brooklands, 1 Dec 1950, C. R. Foskett (MONZ); 1, Mt Matthews, 8 Feb 1930 (MONZ); 2, Days Bay, 9 Oct 1938, G. B. Rawlings, E. S. Gourlay Acc 1970 Ent.Div. (NZAC04016369, MONZ); 1, Otaki Junction, 27 Feb 1909 (MONZ); 1, Wellington, Tararua Ranges, Hector Track, 13 Dec 1963, J. I. Townsend, R. M. Bull coll. (NZAC04017116); 1, Tinakori Hill, Wellington, 28 Aug 1992, 3729 [under card mount] (JNIC); 2, Trentham [mislabelled?], 5 Nov 1916, Broun Coll. (NHML). **South Island**. **NN**. 1, Mt Misery, Ent Div stn, 23 Jan 1977, J. S. Dugdale, at night (NZAC04016974). **Unknown locality**. 5, [no data], Pascoe Coll., 93-60 (NHML); [no data], near 1123, T. Broun coll., A. E. Brookes coll. (NZAC04016940); [no data], T. Broun coll., A. E. Brookes coll. (NZAC04016818); [no data], Broun, 51742, Fry Coll. (NHML). 2, Betonold [hand written, illegible, locality or collector?], 1903-165 (NHML); 1, Waimarenu?, 12 Oct 1933, C.E. Clarke Collection (AMNZ).
- Cryptodacne synthetica*  
**North Island**. **AK**. 4, Waitakere., Broun Coll. (NHML); 1, Auckland, Broun Coll. (NHML); 1, Avic Miller SR, 13 Jul-10 Aug 1999, G. Hall, pit traps (NZAC04016264); 2, Duck Creek SR, 13 Jul-10 Aug 1999, G. Hall, pit traps

(NZAC04016937, -16968); 1, Hunua [Range], 1122 (FREY); 4, Mangatangi, Hunua Range, 8 Feb–8 Mar 1977, I. Barton, ARA Kauri Seed Project pit trap 1 (PESC); ARA Kauri Seed Project pit trap 4 (PESC); ARA Kauri Seed Project pit trap 6 (NZAC04010551); ARA Kauri Seed Project pit trap 13 (NZAC04010560); 1, Mt Dome, Warkworth, 26 Nov 1995 (JNIC); 1, Titirangi, 20 Mar 1913, 1122., T. Broun coll., A. E. Brookes coll. (NZAC04010553); 1, Waitakere, 26 Oct 1914, 1122., T. Broun coll., A. E. Brookes coll. (NZAC04010476); 1, Waitakere Ra, Sharps Bush, 1 Feb 1951, J. C. Watt. **BP.** 1, Blue Lake, 3 Mar 1958, *Knightsia excelsa* (FRNZ); 2, Maungatapu, 25 Sep 1938, 31/49, 23/48 (NZAC04010471, -10467); 2, Okauia, 11 Mar 1927, 1122, A. E. Brookes coll. (PESC); 25 Dec 1922, A. E. Brookes coll. (NZAC04010557). **CL.** 1, Coromandel Mts, 18 Feb 1937, C. E. Clarke Coll. (NHML); 4, Tairua, Broun, [holotype and paratype *C. synthetica*] (NHML); 1122, Broun Coll. (NHML). **ND.** 1, Oruru, Honeymoon Valley, 1 Feb 1960, R. H. M. (FRNZ); 1, Waipoua SF, Toatoa Grove, 25 Nov 1980, G. Kuschel, plants, litter and decayed wood 80/118 (NZAC04010552); 1, Waipoua SF, Yakas Tk, 27 Jul–2 Aug 1998, R. Leschen, FIT 2, RL236 (NZAC04016998); 1, Whau Valley, 11 Aug 1928, A. E. Brookes coll. (NZAC04010574). **TO.** 1, Ohakune, 9 Nov 1920, H. H. (MONZ); 1, Raurimu, 27 Dec 1940, C. E. Clarke Coll. (AMNZ); 1, SF 90, 19 Nov 1958, *Nothofagus fusca* (FRNZ); ?TO, 28, [no data on specimens] ?Opepe Res, {label below group}, 19 October 1959, W59/40 (FRNZ). **WA.** 1, Mangaone V. Rd, 12 km. S. Pahiatua, 1 Mar 1992, V. Munro, pit trap in manuka scrub (JNIC); 1, Pori, 24–28 Feb 1956, E. S. Gourlay, E. S. Gourlay Acc. 1970 Ent. Div. (NZAC04010603); 1, Tuhitarata Res. Lake Ferry, 15 m, 16 Jan 1984, P. Hammond, debris (NHML). **WN.** 2, Gollan's V., 10 Apr 1926, C. E. Clarke Coll. (NHML); 4, Gollan's V. Well., 10 Apr 1924, G. V. Hudson, C. E. Clarke Coll. (AMNZ); 1, Karori Reservoir, 9 Oct 1994, underside of pine log (JNIC); 1, Makara, G. V. Hudson, E. S. Gourlay Acc. 1970 Ent. Div. (NZAC04010586); 3, Otaki Junction, 27 Feb 1909 (MONZ); 1, Tararua Ra., 1300', 20 Aug 1921, mossy trunk at night (NZAC04010523); 1, Tinakori Hill, Wellington, 28 Aug 1992, 1962 [under card mount] (JNIC); 1, 28 Aug 1971 (JNIC); 1, 20 May 1905, 94 (JNIC); 28 Aug 1992, in decayed wood (JNIC); 1, Wellington, 1 Aug 1902, J. J. Walker, K16078. (AMIC); 1, 1554, Broun Coll. (NHML); 1, G. V. Hudson, 1276 (PESC); 3, 1 Aug 1902, J. J. Walker, G. C. Champion Coll B.M.1927-409 (NHML); 1, 1554 [holotype *C. vittata*] (NHML); 1, Wharite P, Sth Ruahine., 2 Feb 1958, R. M. Bull coll (NZAC04010571). **South Island.** **BR.** 1, L. Rotoiti, 2 Jan 1935, E. S. Gourlay, E. S. Gourlay Acc. 1970 Ent. Div. (NZAC04010631); 10, Greymouth, Helms, Sharp Coll. 1905-313 (NHML); 3, Helms (BPBM); 2 (FMNH); 3, L. Rotoiti, 13 Nov 1999, R. Leschen, ex *Panellus* RL457 (NZAC04016461, -16245, -16881); 1, Nelson Lakes NP, Matakaitaki R., 730 m, 17 Dec 1987, R. M. Emberson, at night on moss, *Nothofagus fusca* forest (LUNZ); 1, 1290 m, 18–26 Dec 1984, A. Newton, M. Thayer, FMHD #85-446 *Nothofagus solandri*, log & leaf litter #716 [in alcohol] (FMNH). **FD.** 3, Routeburn Tk, 11 May 2000, R. Leschen, RL568 (NZAC04016227, -16299, -16743); 1, Hunter Mtns, Mt Burns, 800 m, 1 Jan

1970, Manapouri Expd at night on wet rocks wide stream (NZAC04017031). **KA.** 1, Half Moon Bay, Ohau Stream Walk, 17 Nov 1999, R. Leschen, rotting logs/at large/at night RL490 (NZAC04017065). **MB.** 1, Pelorus Bridge SR, 35 m, 15 Dec 1984–4 Jan 1985, A. Newton, M. Thayer, FMHD #85-441, hdwd.podocarp for. leaf & log litter #711 (FMNH); 1, Wakamarina [nr. Canvastown], 12 Aug 1966, A. K. Walker, [1-PESC] (NZAC04010554); **MC.** 1, Mt Hutt [?, hand written- mislabeled?], 13 Apr 1912, 1122., T. Broun coll., A. E. Brookes coll. (NZAC04010618); 3, Mt Hutt [?, hand written], 12 Apr 1912, Broun Coll. (NHML). **NC.** 1, Arthur's Pass National Park, Klondyke Corner, 700 m, 27 Dec 1993, D. H. Kavanaugh, stop #93-27 (CASC). **NN.** 1, Balloon Hut, 22 Jan 1943, E. S. Gourlay, E. S. Gourlay Acc.1970 Ent.Div. (NZAC04010583); 4, Dun Mt, 2000', 4 Feb 1933, E. S. Gourlay, E. S. Gourlay Acc. 1970 Ent.Div. (PESC, NZAC04010594, -10621); 2, Glenhope, 20 Feb 1915, 3156, T. Broun coll., A. E. Brookes Coll. (NZAC04010617, -10620); 1, Hope Saddle, 2000', 13 Mar 1966, J. C. Watt, ex fumagine fungus (NZAC04010629); 1, Hope River, Rough Creek, 6 Aug 1983, P. M. Johns (NZAC04016301); 1, Mt Arthur, 1200 m, 13–20 Nov 1969, J. I. Townsend, at night (PESC); 1, Mt Burnett, 450 m, 8 Feb 1981, R. R. Scott, beating (LUNZ); 1, Mt Hope, 14 Feb 1915, Broun Coll. (NHML); 1, Oparara, 13–19 Nov 1957, E. S. Gourlay (NZAC04010632); 2, Slaters Road, 0.7 km.S. Whangamoia Saddle, 410 m, 29 Dec 1984, A. Newton, M. Thayer, #703, ANMT Lot No. 84-19, *Laetiporus portentosus* (Polyporales) (PESC); 1, Cobb Ridge, E. of Cobb Reservoir, 990 m, 2 Jan 1985, A. Newton, M. Thayer, FMHD #85-461, *Nothofagus* spp. for. log & leaf litter #728 (FMNH); 2, Takaka Hill, 2000', 19 Feb 1957, E. S. Gourlay (NZAC04010530, -10581); 3, Upper Maitai, 1 May 1946, E. S. Gourlay (NZAC04010568, -10589, -10637); 1, Ngakawau, Charming Creek Walk, 4 May 2006, R.A.B. Leschen & E. Hilario, ex *Laetiporus portentosus*, RL1108B, 41.60916S, 171.91257E. **OL.** 1, Makarora Bush, Makarora, 7–9 Nov 1997 (JNIC). **SD.** 3, Maud Island, 12–15 May 1990, D. Townsend (JNIC); 1, Picton, 1 Sep 1969, G. Kuschel (NZAC04010633); 1, T. Broun coll., A. E. Brookes coll. (NZAC04010578); 1, Queen Charlotte Sd, Endeavour Inlet, 5 Jan 1993, J. W. M. Marris, under loose bark of *Dacrydium cupressium*, mixed broadleaf/podocarp forest (LUNZ); 1, under bark of rotten log, mixed broadleaf/podocarp forest (LUNZ); 1, Tennyson Inlet, E.side of Duncan Bay, 30 m, 15 Dec 1984–5 Jan 1985, A. Newton, M. Thayer, FMHD #85-438, Podo-*Nothofagus* for. litter u. palm leaf litter #709 (FMNH); 1, Tennyson Inlet, W.side Te Mako Bay, 125 m, 15 Dec 1984–5 Jan 1985, A. Newton, M. Thayer, FMHD #85-439, *Nothofagus* podo-hdwd log & leaf litter #710 (FMNH); 1, Tennyson Inlet, Tuna Bay, 2 Feb 1978, S. & J. Peck, litter (NZAC04010624). **Unknown locality.** 1, [no data], Dom. Mus. Exch. (NZAC04016774); 1, [no data], 1122, T. Broun (NMNH); 5, [no data], Helms, Reitter (HNMH); 2, [no data] (FREY); 1, [no data], 1122, T. Broun coll., A. E. Brookes coll. (NZAC04010538); 1, [no data], 1122, T. Broun coll., A. E. Brookes coll. (NZAC04010484); 2, [no data], ex. Simson, G. C. Champion Coll. B.M.1927-409 (NHML); 1, [no data], 3156, Helms Reitter, Broun Coll. (NHML); 1, [no data], Sharp Coll. 1905-313 (NHML);

1, [no data], 1122, Broun Coll. (NHML); 1, ?Waikawa, 20 March 1910 (MONZ).

### *Cryptodacne ferrugata*

**North Island. AK.** 1, Waitakere, 26 Oct 1914, 1122, T. Broun coll, A. E. Brookes coll.; 2, Auckland, Wattle Bay, 11 Jan 1984, P. M. Hammond, bracket fungi (NHML); 17, Auckland, Mt Eden, 2 Mar 2000, S. E. Thorpe, on bracket fungi at night (AMNZ); 1, Auckland, Mt Eden, Witheil Thomas Park, 17 Oct 2002, S. E. Thorpe, on bracket fungi at night (AMNZ); 1, Henderson, Henderson Valley, Opanuku Stm. 2 Nov 2002, S. E. Thorpe, on bracket fungi at night (AMNZ); 3, Auckland, H. Swale 1913-117 (NHML); 36, Lynfield, 27 Dec 1975, G. Kuschel, decayed wood (NZAC04013187, -10519, -10599, -10602, -10604, -10607, -10611, -16253, -16318, -16328, -16350, -16358, -16411, -16473, -16497, -16522, -16580, -16627, -16654, -16655, -16668, -16756, -16779, -16799, -16838, -16840, -16847, -16856, -16922, -16939, -16981, -17021, -17029, -17043, -17066, -17087); 1, Lynfield, 17 Jul 1976, G. Kuschel, decayed wood and ferns (NZAC04010558); 1, Lynfield, 3 May 1975, G. Kuschel, on *Pseudopanax* [2-PESC] (NZAC04010536); 6, Lynfield, 4 May 1975, G. Kuschel, litter 75/80 (NZAC04010499, -10501, -10508, -10533, -10601, -10628); 2, Lynfield, 19 Apr 1975, G. Kuschel, litter 75/74 (NZAC04016326, -16933); 1, Lynfield, 21 Sep 1980, G. Kuschel, rotten wood (NZAC04016453, PESC); 2, Lynfield, 15 Dec 1975, G. Kuschel (NZAC04010500, -10605); 3, Lynfield, 13 Apr 1975, G. Kuschel, litter 75/74 (NZAC04010610, -16314, -16584); 1, Lynfield, 21 Jun 1976, G. Kuschel (NZAC04010493); 1, Lynfield, 10 Jul 1976, G. Kuschel, decayed wood (NZAC04016573); 2, Lynfield, Tropicana Drive, 25 Oct 1975, G. Kuschel, *Ganoderma* on *Acacia* (NZAC04016817, -16890); 1, Mt Eden, Auckland, 5 Mar 2002, in bush remnant (JNIC); 1, Woodhill, nr. Helensville, 1445 [holotype *C. vagepunctata*] (NHML). **BP.** 1, Mamaku Plat., Galaxy Rd., 550 m, 11–25 Mar 1978, S. & J. Peck, bracket fungi (ANIC). **CL.** 2, Great Barrier I, Little Windy Hill, 18 Mar 2003, S. E. Thorpe, on underside of bracket fungus in forest at night (AMNZ). **ND.** 1, Whau Valley, 11 Aug 1928, A. E. Brookes (NZAC04010511); 1, SH12 Waipoua SF, 20 Sep 1977, D. W. Helmore, rotten stumps trees 77/102 (NZAC04017112). **TO.** 1, Mamaku Plateau, 550 m, 6 Mar 1978, S. B. Peck, trap (PESC); 1, Minginui SF, 28 Jul 1977, J. S. Dugdale, litter 77-88 (NZAC04010504); 1, Opepe, 10 Mar 1978, J. S. Dugdale, at night (NZAC04010487). **WN.** 1, Akatarawa, Kakanui Pk, 850 m, 9 Mar 1978, S. & J. Peck, bracket fungi [1-PESC] (NZAC04010634); 1, 10 km. S. Levin, Tararua SF, Waiwaka Stream, 180 m, 8 Mar 1978, S. & J. Peck, bracket fungi (ANIC). **South Island. BR.** 2, Greymouth, Helms, 3156 [NOT type, topotype *C. ferrugata* female] (NHML); Sharp Coll. 1905-913 [topotype *C. ferrugata* male, with 2 *C. synthetica*] (NHML). **DN.** 1, Grahams Bush, Mt Cargill, 1 May 2003, flight intercept trap (JNIC); 2, 15 Dec 2002, flight intercept trap (JNIC); 1, Mount Cargill, 5 Oct 2002, in dead *Dracophyllum* wood (JNIC); 1, Vauxhill, Dunedin, 1 Jul 2000, flight intercept trap (JNIC); 2, Waipori

Gorge, 8 Jun 2002, in decayed wood (JNIC); 1, Waitati Bridge, 18 Oct 1927, C. E. Clarke Coll. (NHML); 1, 18 Oct 1925, C. E. Clarke, E. S. Gourlay Acc. 1970 Ent. Div. (NZAC04010638); 1, Woodside Glen, Outram, 12 May 2002, in dead beech branch (JNIC); 1, 5 Feb 2000, in lichen on dead *Nothofagus* (JNIC). **NN.** 1, Karamea Bluff, 9 Feb 1999, R. Leschen, sooty mould RL284 (NZAC04017030); 1, Marahau, 11 Mar 1971, G. W. Ramsay (NZAC04010600); 2, Mt Duppa, 26 Oct 1958, J. I. Townsend, R. M. Bull collection (NZAC04010608). 1, Whangamoa, 1500', 13 May 1966, J. I. Townsend, in dead *Fomes* (NZAC04010609); 1, trap #3 (NZAC04010615). **OL.** 2, Makarora Bush, Makarora, 7–9 Nov 1997 (JNIC). **SI.** 1, Stewart I, Codfish I, Summit Tk, 250 m, 30 Nov 1981, B. A. Holloway (NZAC04010472). **SL.** 1, Invercargill, Thomsons Bush, 27 Jan 1984, P. M. Hammond, flood debris (NHML); 2, Lake Te Anau, Mistletoe Creek, 23 Dec 1993, D. H. & T. W. Kavanaugh, stop #93-23A (CASC); 2, Papatowai SR, 46°34'S, 169°29'E, 15 Feb 2003, R. Leschen, at large at night, RL729 (NZAC04010584); 1, Papatowai, Catlins, 6 Oct 2002, in dead tree fern stump (JNIC); 1, Tisbury, 14 Oct 1910, 508 (NZAC04010537); 1, 3 Nov 1910 (NZAC04010528); 1, 29 Sep 1910, 508, near 3360?, T. Broun, A. E. Brookes (NZAC04010534). **WD.** 1, Haast River, Sunny Flat, 100 m, 25 Jan 1978, G. Kuschel, sifted litter 78/54 [1-PESC] (NZAC04010494). **Unknown locality.** 1, [no data], Dom. Mus. Exch. (NZAC04010473); 3, [no data] (BPBM).

### *Cryptodacne pubescens*

**North Island. WA.** 1, Mangaone V. Rd, 12 km S. Pahiatua, 1 Apr 1992, V. Munro, pit trap gorse scrub, 95 (JNIC). **WI.** 2, Bruce Park SH1, 260 m, 3–6 Feb 2000, J. W. Early, pan trap L7572 (AMNZ). **WN.** 1, Korakora, 1 Aug 1936, G. V. Hudson (NHML); 1, Waikanae, 25 Jan 1946, R. W. Hornabrook, 1554, under var. logs, A.E. Brookes coll. (NZAC04010543); 1, Tinakori Hill, Wellington, 1 Aug 1991, in decayed wood, 292 (JNIC); 3, Wellington, Hudson, Sharp Coll. (NHML); 21 Feb 1909 (NZAC04010463). **South Island. DN.** 1, Moeraki, 2320 [holotype *C. pubescens*] (NHML). **KA.** 3, Oaro, 13 Apr 1980, R. M. Emberson, pitfall trap bush edge (LUNZ); Wairii, Eastern Kaikouras, 3360 [lectotype and paratype *C. ocularia*] (NHML). **NN.** 2, Nelson, 26 Apr 1969, J. E. Tobler (CASC). **SD.** 3, Stephens I, 13 Nov 2002, S. M. Pawson, on *Coprosma* bark at night (LUNZ); 1, Queen Charlotte Sound, Bay of Many Coves, 28 Dec 1986, J. W. M. Marris, in rotting log [1-PESC] (LUNZ). **Unknown locality.** 2, [no data], 1 Sep 1925, [R. M. Bull coll.], Eo.I, in decayed wood in bush grasslands [1-PESC], (NZAC04010556, -10559).

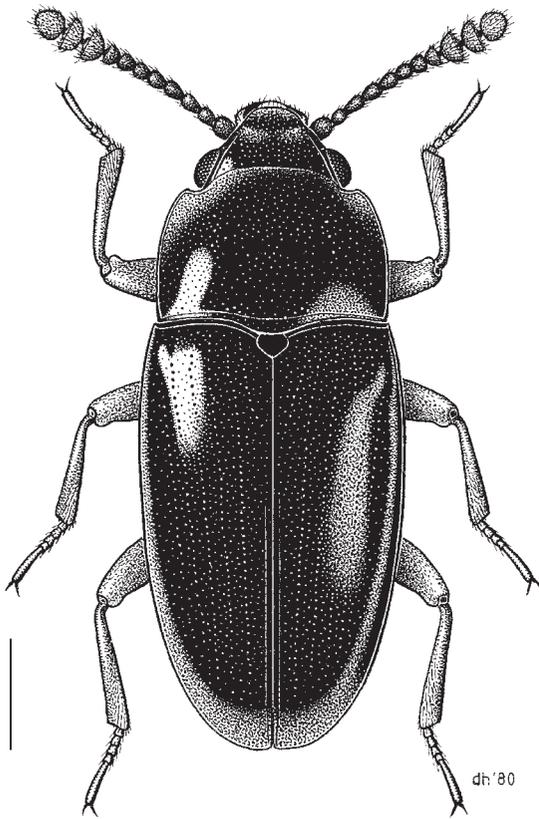
### *Cryptodacne brounii*

**North Island. AK.** 2, Auckland, Pascoe Coll. 93-60 [holotype and paratype] (NHML).

### *Cryptodacne rangiauria*

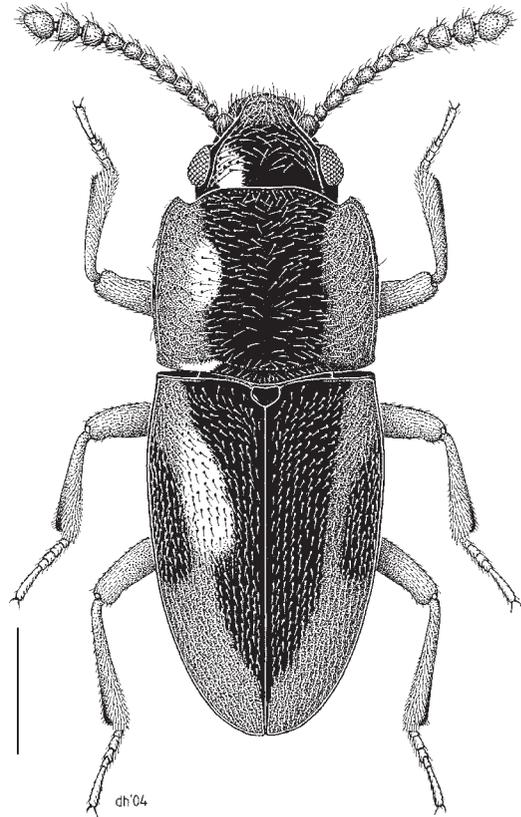
**Offshore islands. CH.** 1, Pitt I., North Head, 1 Dec 1992, R. M. Emberson, under bark of *Corynocarpus laevigatus* tree [holotype] (LUNZ).

ILLUSTRATIONS



1

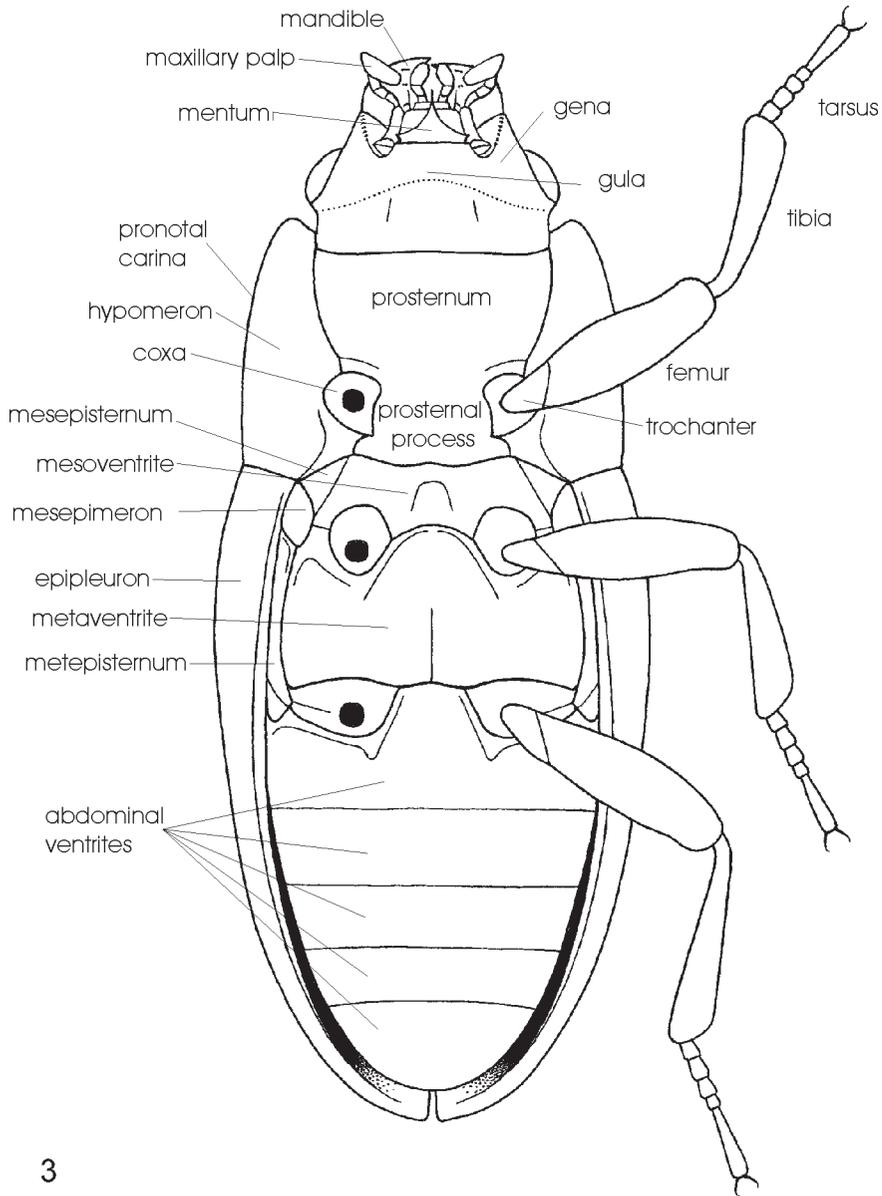
*Kuschelengis politus*



2

*Cryptodacne synthetica*

Fig. 1–2 Dorsal habitus (scale bar = 1 mm): (1) *Kuschelengis politus*; (2) *Cryptodacne synthetica*.



**Fig. 3** *Cryptodacne synthetica*, ventral habitus modified from Leschen (2003).



*Kuschelengis politus*



*Cryptodacne brounii*

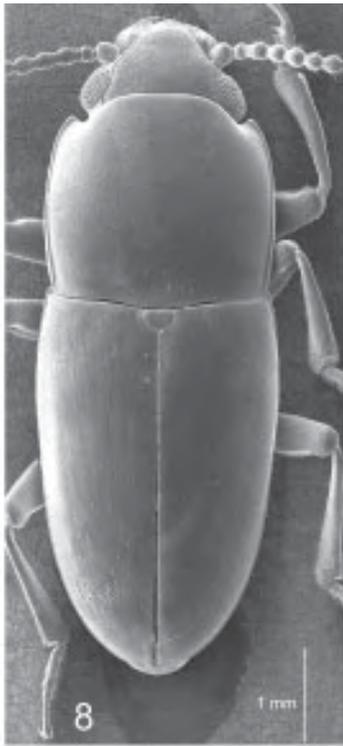


*Cryptodacne ferrugata*



*Cryptodacne lenis*

**Fig. 4–7** SEM dorsal habitus: (4) *Kuschelengis politus*; (5) *Cryptodacne brounii* holotype; (6) *Cryptodacne ferrugata* topotype; (7) *Cryptodacne lenis* holotype.



*Cryptodacne nui*



*Cryptodacne pubescens*

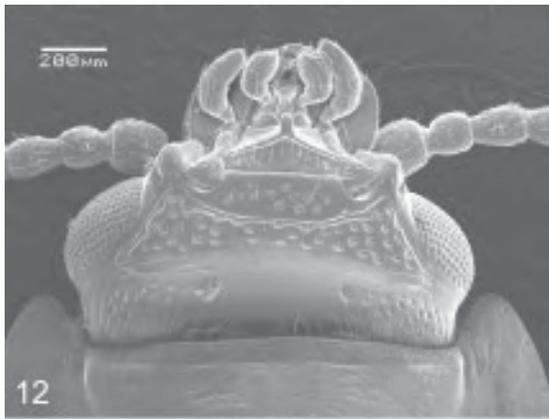


*Cryptodacne rangiauria*

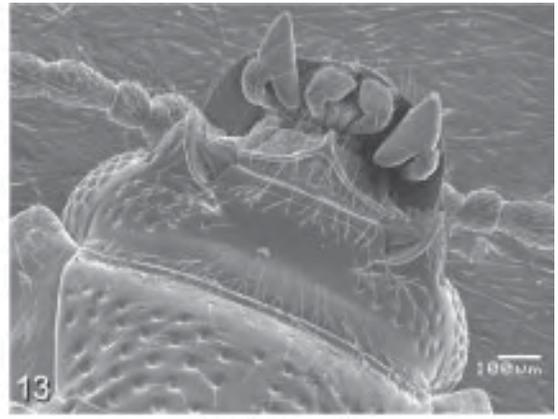


*Cryptodacne synthetica*

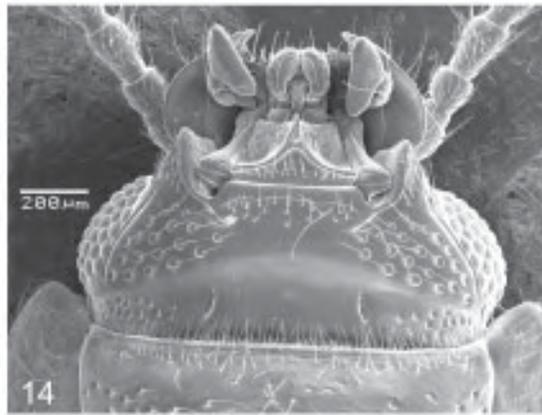
**Fig. 8–11** SEM dorsal habitus: (8) *Cryptodacne nui*; (9) *Cryptodacne pubescens* (*C. ocularia* paralectotype); (10) holotype *Cryptodacne rangiauria* holotype; (11) *Cryptodacne synthetica* holotype.



*K. politus*

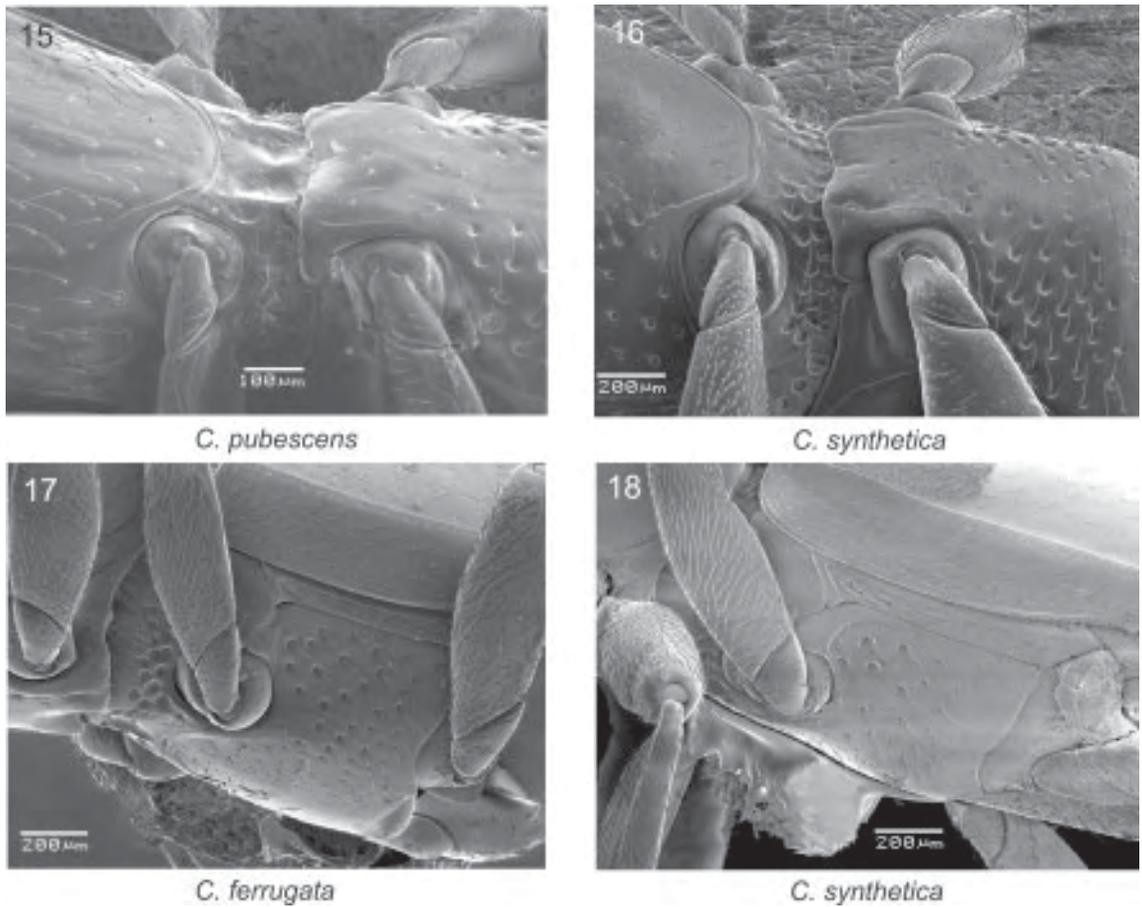


*C. rangiauria*

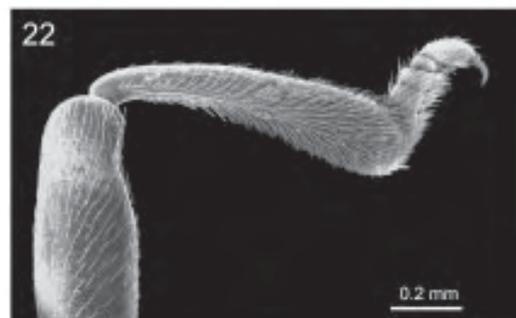


*C. synthetica*

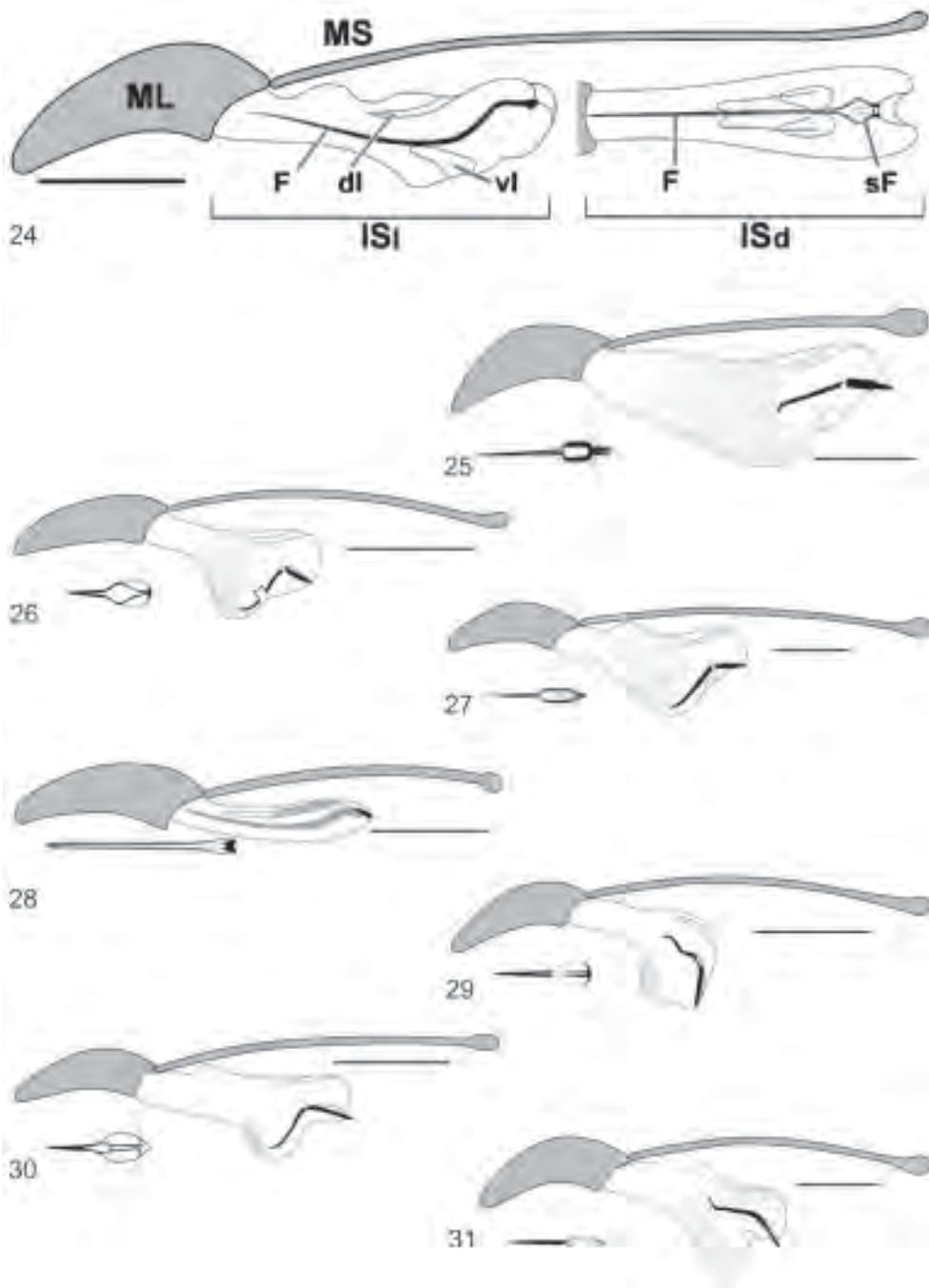
**Fig. 12–14** SEM venter of head: (12) *Kuschelengis politus*; (13) *Cryptodacne rangiauria* holotype; (14) *Cryptodacne synthetica* holotype.



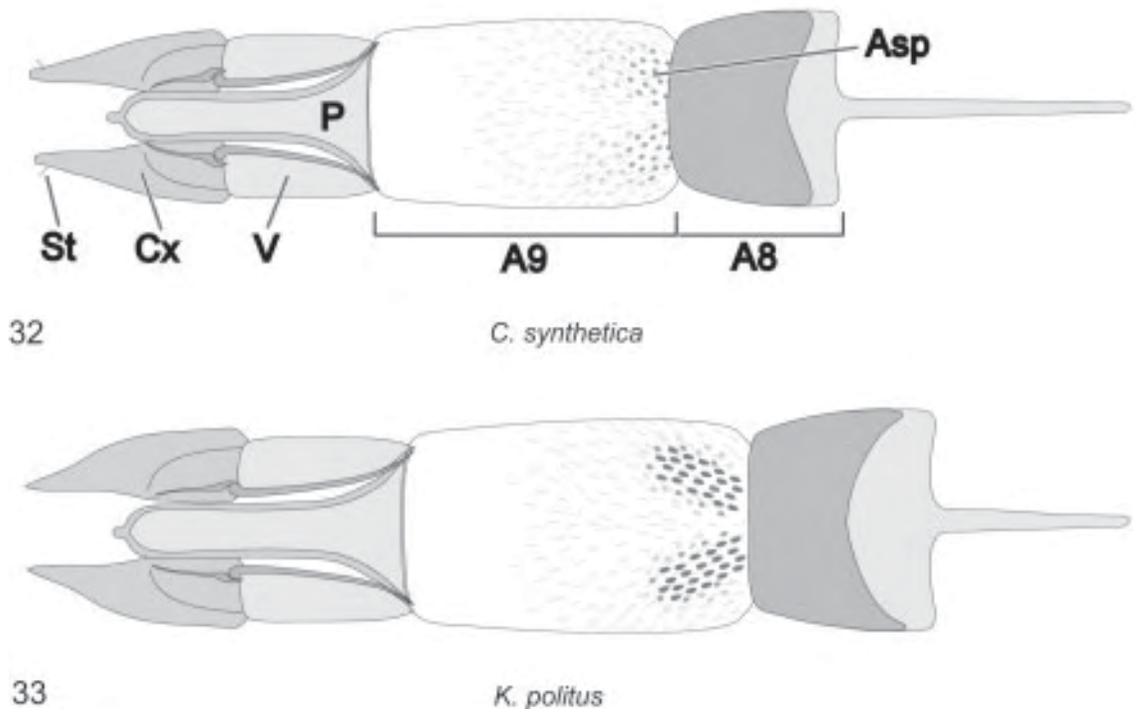
**Fig. 15–18** SEM of ventrites: (15) *Cryptodacne pubescens* holotype (lateral mesoventrite); (16) *Cryptodacne synthetica* holotype (lateral mesoventrite); (17) *Cryptodacne ferrugata* (lateral metaventrite); (18) *Cryptodacne synthetica* (lateral metaventrite).

*K. politus**C. rangiauria**C. synthetica**C. synthetica*

**Fig. 19–23** SEM of ventrites and legs: (19) *Kuschelengis politus* (prosternum); (20) *Cryptodacne rangiauria* holotype (prosternum); (21) *Cryptodacne synthetica* holotype (prosternum); (22) *Cryptodacne synthetica*, female protibia in anterior view; (23) *Cryptodacne synthetica*, male protibia in anterior view.



**Fig. 24–31** Penis in lateral view, with inset dorsal view of internal sac or flagellum with sclerite at base of flagellum (scale bar = 0.4 mm). (24) *Cryptodacne nui* (dl = dorsal lobe of internal sac, F = flagellum, ISd = internal sac dorsal view, ISI = internal sac lateral view, ML = median lobe, MS = median strut, sF = sclerotization at base of flagellum, vl = ventral lobe of internal sac); (25) *Cryptodacne brounii*; (26) *Cryptodacne ferrugata*; (27) *Cryptodacne lenis*; (28) *Cryptodacne synthetica*; (29) *Cryptodacne pubescens*; (30) *Cryptodacne rangiauria*; (31) *Kuschelengis politus*.



**Fig. 32–33** Female genitalia in dorsal view. (32) *Cryptodacne synthetica* (A8 = sternite 8, A9 = sternite 9, Asp = asperities, Cx = coxite, P = paraproct, St = stylus, V = valvifer); (33) *Kuschelengis politus*.

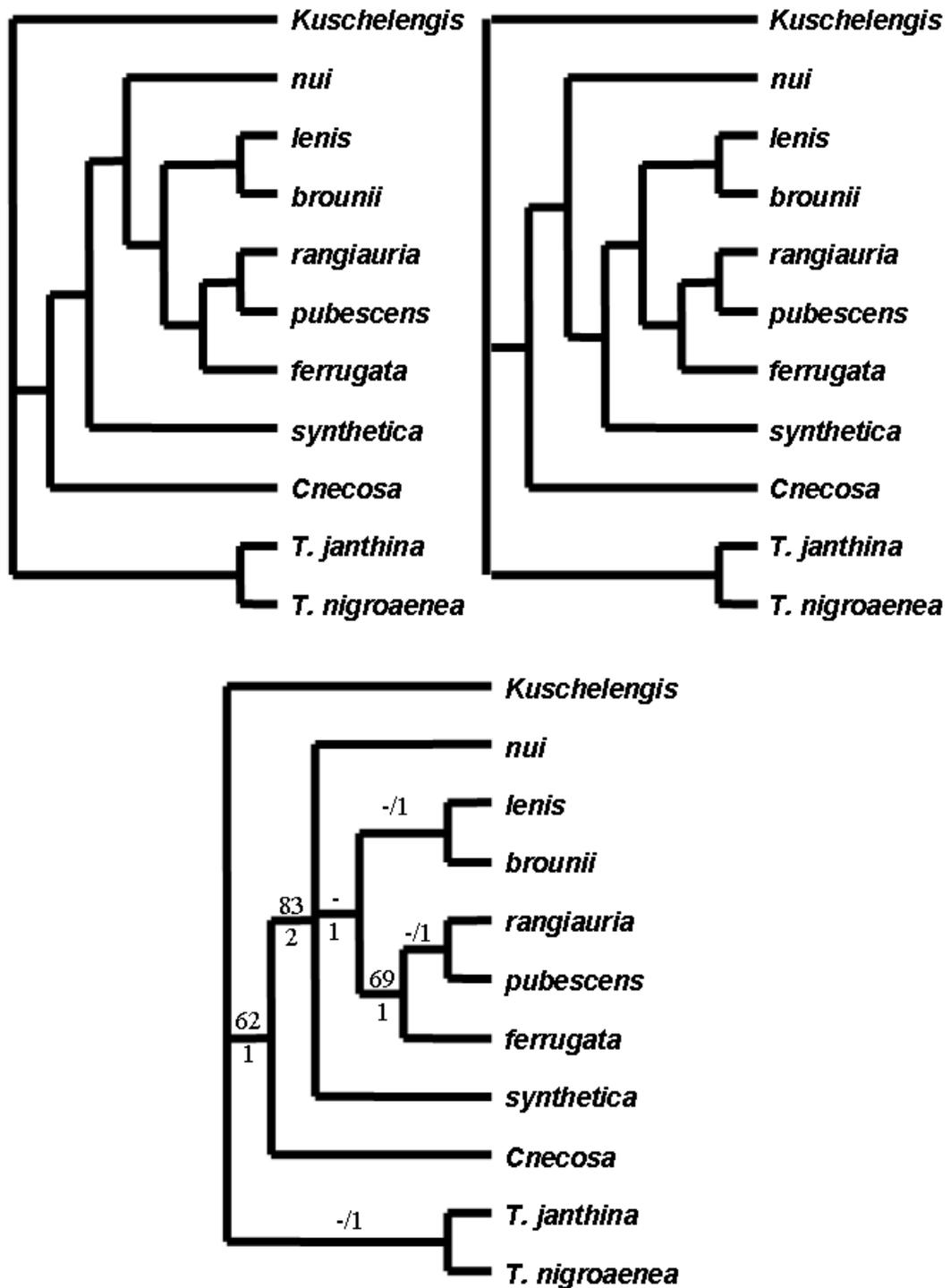


Fig. 34 Three most-parsimonious trees showing the relationships among species of *Cryptodacne*.

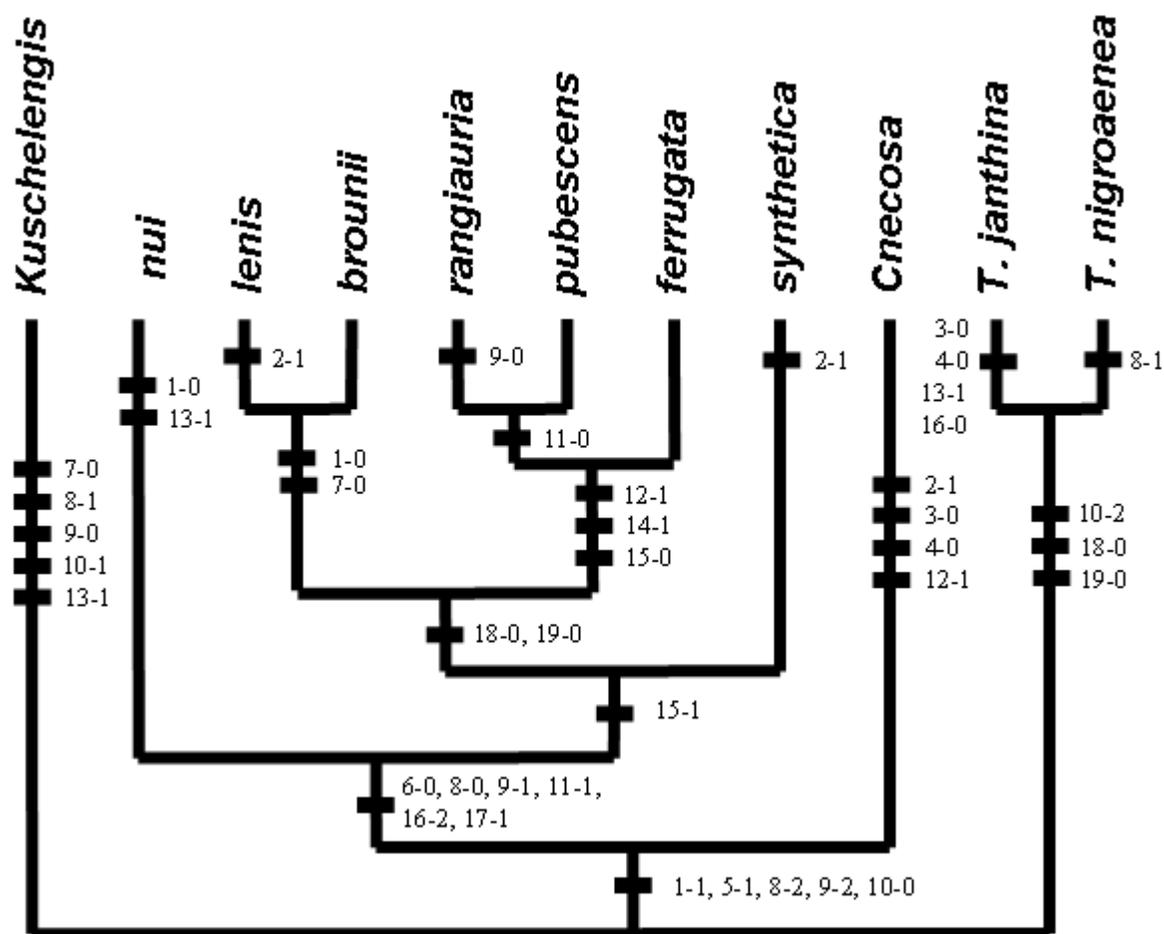
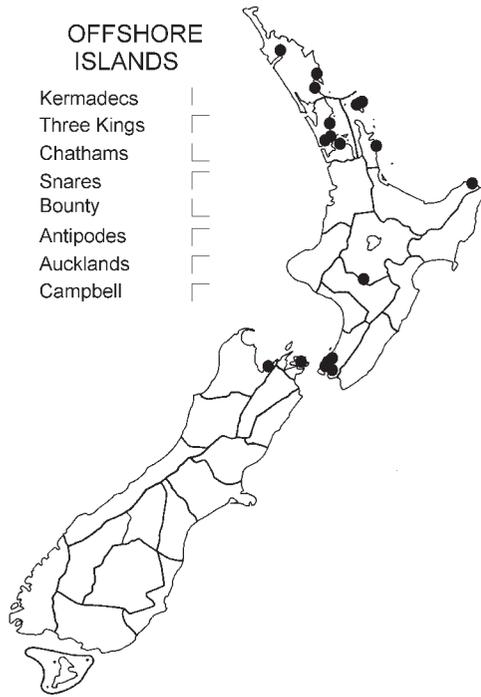
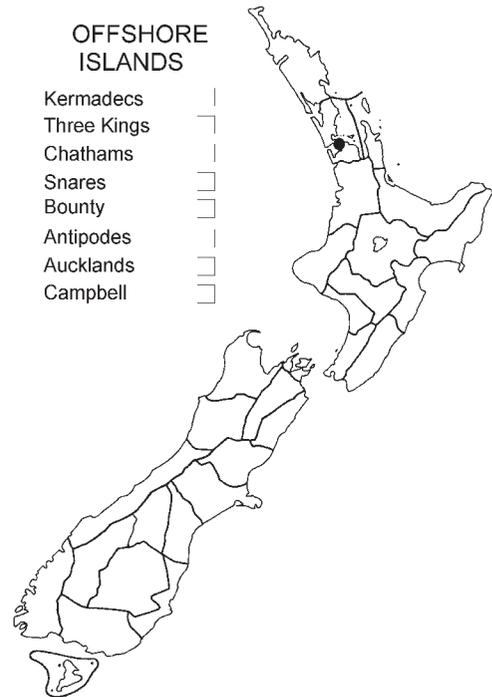


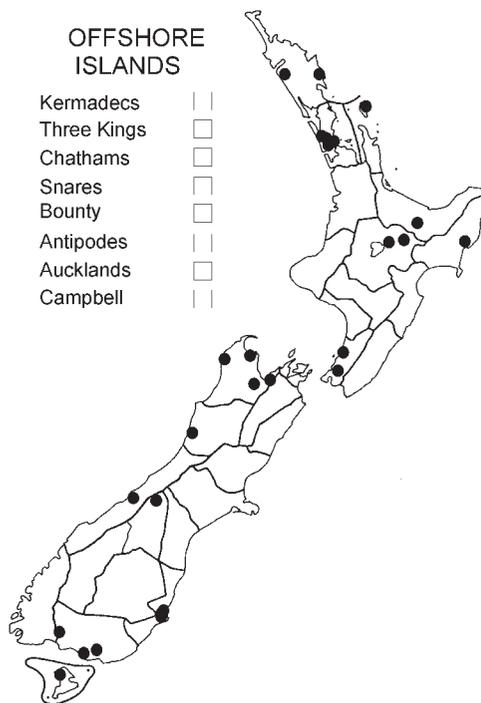
Fig. 35 One of three most-parsimonious trees of relationships among species of *Cryptodacne* with characters mapped on branches.



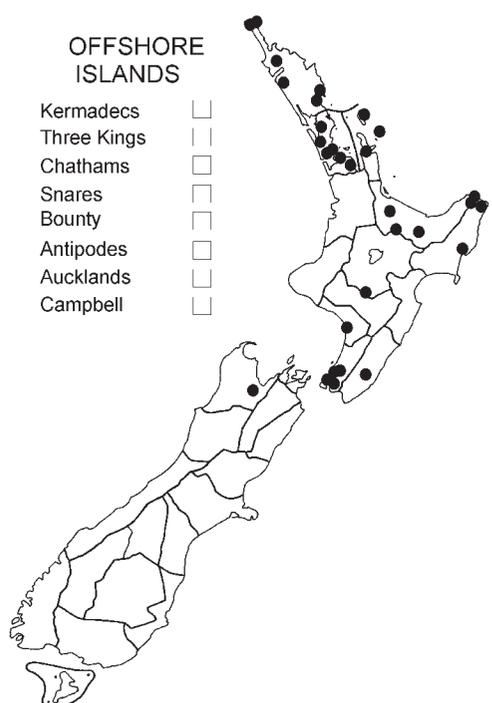
**Map 1** Collection localities, *Kuschelengis politus*



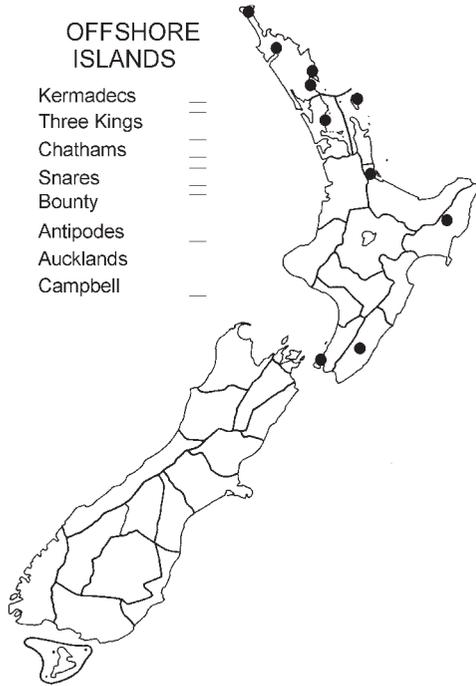
**Map 2** Collection localities, *Cryptodacne brounii*



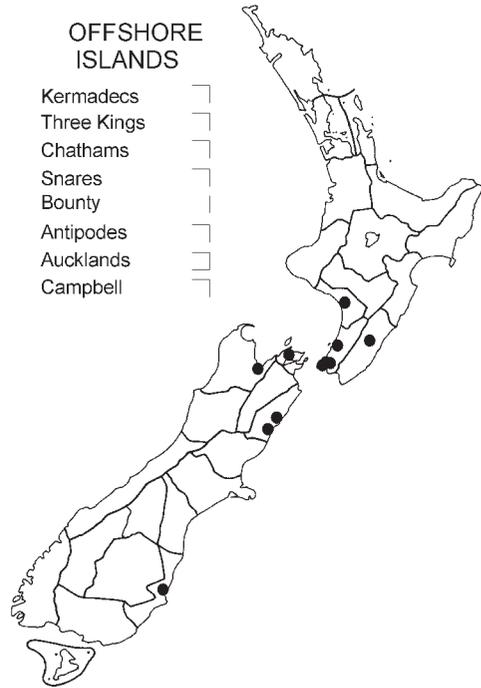
**Map 3** Collection localities, *Cryptodacne ferrugata*



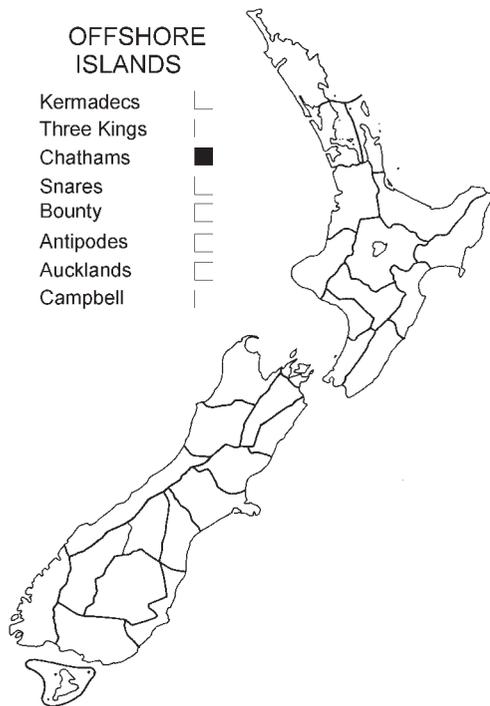
**Map 4** Collection localities, *Cryptodacne lenis*



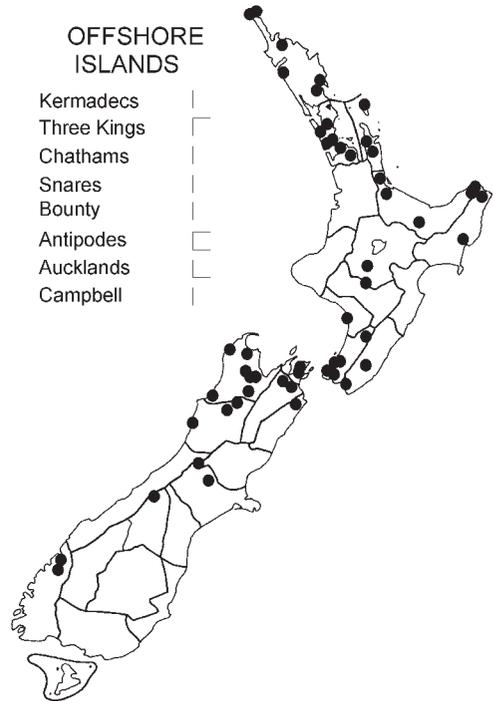
Map 5 Collection localities, *Cryptodacne nui*



Map 6 Collection localities, *Cryptodacne pubescens*



Map 7 Collection localities, *Cryptodacne rangiauria*

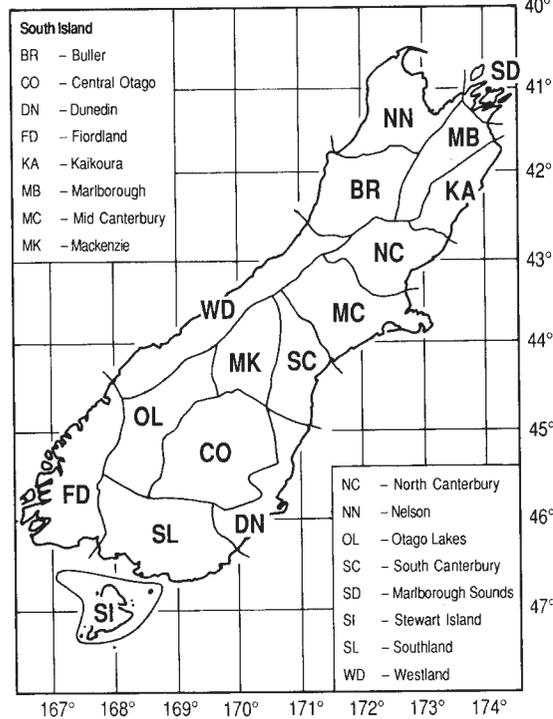
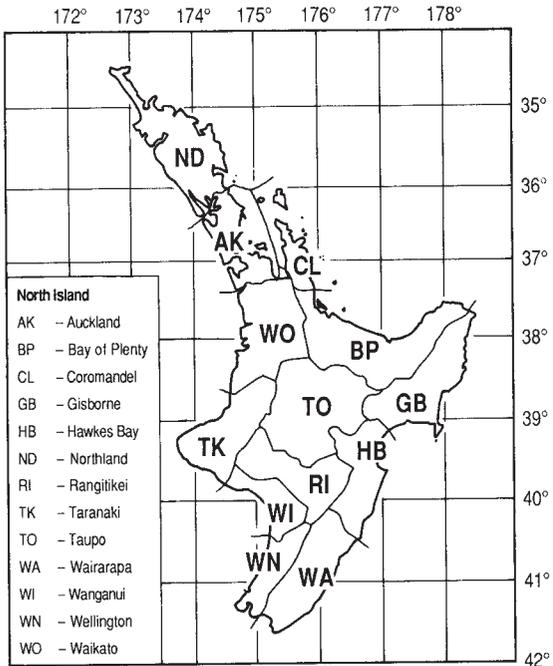


Map 8 Collection localities, *Cryptodacne synthetica*

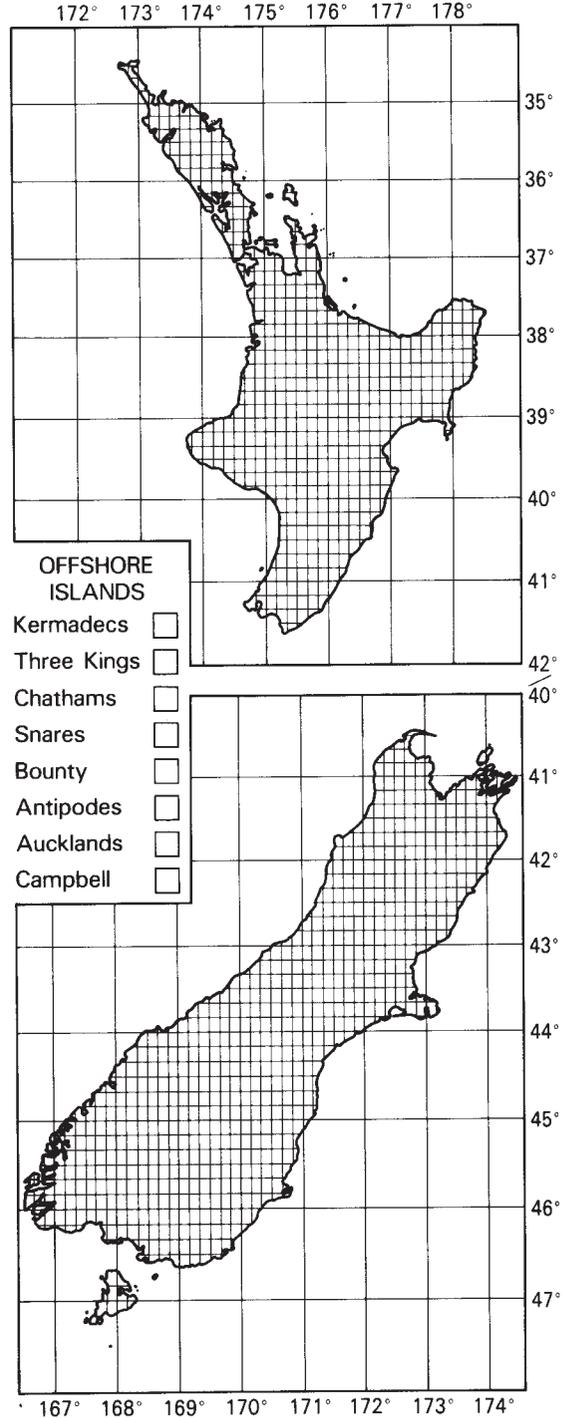
## TAXONOMIC INDEX

Taxa in bold type are those included in the checklist. Page numbers in **bold** type indicate the start of a description and in *italic* type an illustration. A suffixed letter "m" indicates a map. Non-Coleoptera are indicated by the higher rank in parentheses.

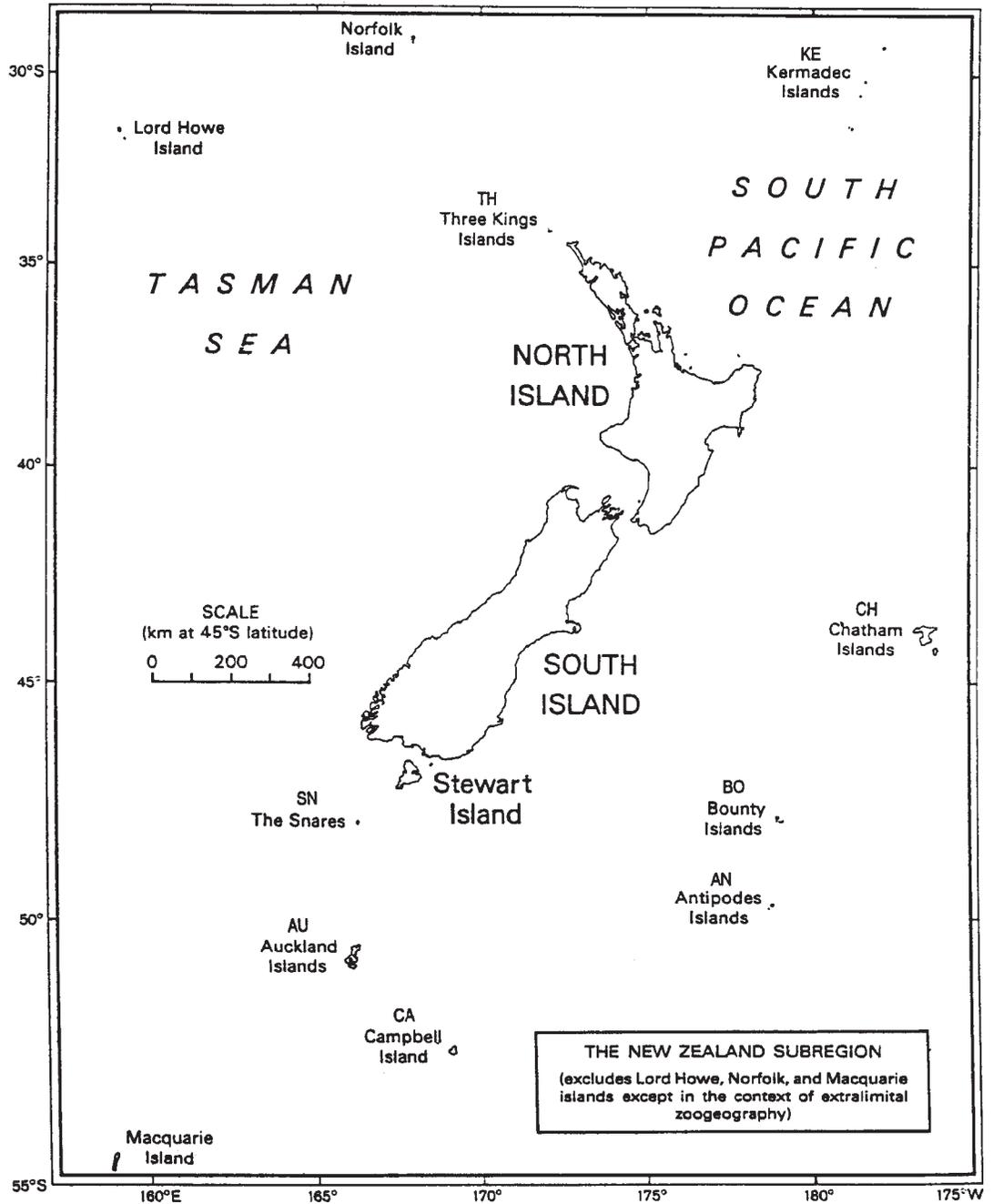
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Area codes and boundaries used to categorise specimen locality data (after Crosby *et al.* 1976)



Base-map for plotting collection localities; this may be photocopied without copyright release



The New Zealand subregion with area codes (from Crosby *et al.* 1998).

## TITLES IN PRINT / PUNA TAITARA TAA

- 1 **Terebrantia** (Insecta: Thysanoptera). *Laurence A. Mound & Annette K. Walker*. ISBN 0-477-06687-9, 23 Dec 1982, 120 pp. .... \$29.95
- 2 **Osoiriinae** (Insecta: Coleoptera: Staphylinidae). *H. Pauline McColl*. ISBN 0-477-06688-7, 23 Dec 1982, 96 pp. .... \$18.60
- 3 **Anthribidae** (Insecta: Coleoptera). *B.A. Holloway*. ISBN 0-477-06703-4, 23 Dec 1982, 272 pp. .... \$41.00
- 4 **Eriophyoidea except Eriophyinae** (Arachnida: Acari). *D.C.M. Manson*. ISBN 0-477-06745-X, 12 Nov 1984, 144 pp. .... \$29.95
- 5 **Eriophyinae** (Arachnida: Acari: Eriophyoidea). *D.C.M. Manson*. ISBN 0-477-06746-8, 14 Nov 1984, 128 pp. ... \$29.95
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He titiro whāiti tā tēnei pukapuka ki ngā mea noho whenua, kāore he tuarā; i pēnei ai i te mea kei te mōhio whānuitia ngā mea whai tuarā, ā, ko ngā mea noho moana, koirā te tino kaupapa o te huinga pukapuka *Marine Fauna of N.Z.*

Ka āhei te tangata ki te **whakauru tuhituhinga** mehemea kei a ia ngā tohungatanga me ngā rauemi e tutuki pai ai tana mahi. Heoi anō, e wātea ana te Kohinga Angawaho o Aotearoa hei āta tiro tiro mā te tangata mehemea he āwhina kei reira.

Me whāki te kaituhi i ōna whakaaro ki tētahi o te Kāhui Ārahi Whakarōpūtanga Tuarā-Kore, ki te ġtita rānei i mua i te timatanga, ā, mā rātou a ia e ārahi mō te wāhi ki tana tuhinga.

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Te utu (tirohia “Titles in print”, whārangi 55). Ko te kōpaki me te pane kuini kei roto i te utu. Me utu te hunga e noho ana i Aotearoa me Ahitereiria ki ngā tāra o Aotearoa. Ko ētahi atu me utu te moni kua tohua, ki ngā tāra Merikana, ki te nui o te moni rānei e rite ana.

E toe ana he pukapuka o ngā putanga katoa o mua. Mehemea e hiahia ana koe ki te katoa o ngā pukapuka, ki ētahi rānei, tonoa mai kia whakaheke te utu. Tekau ōrau te heke iho o te utu ki ngā toa hoko pukapuka.